

JANUARY 1989

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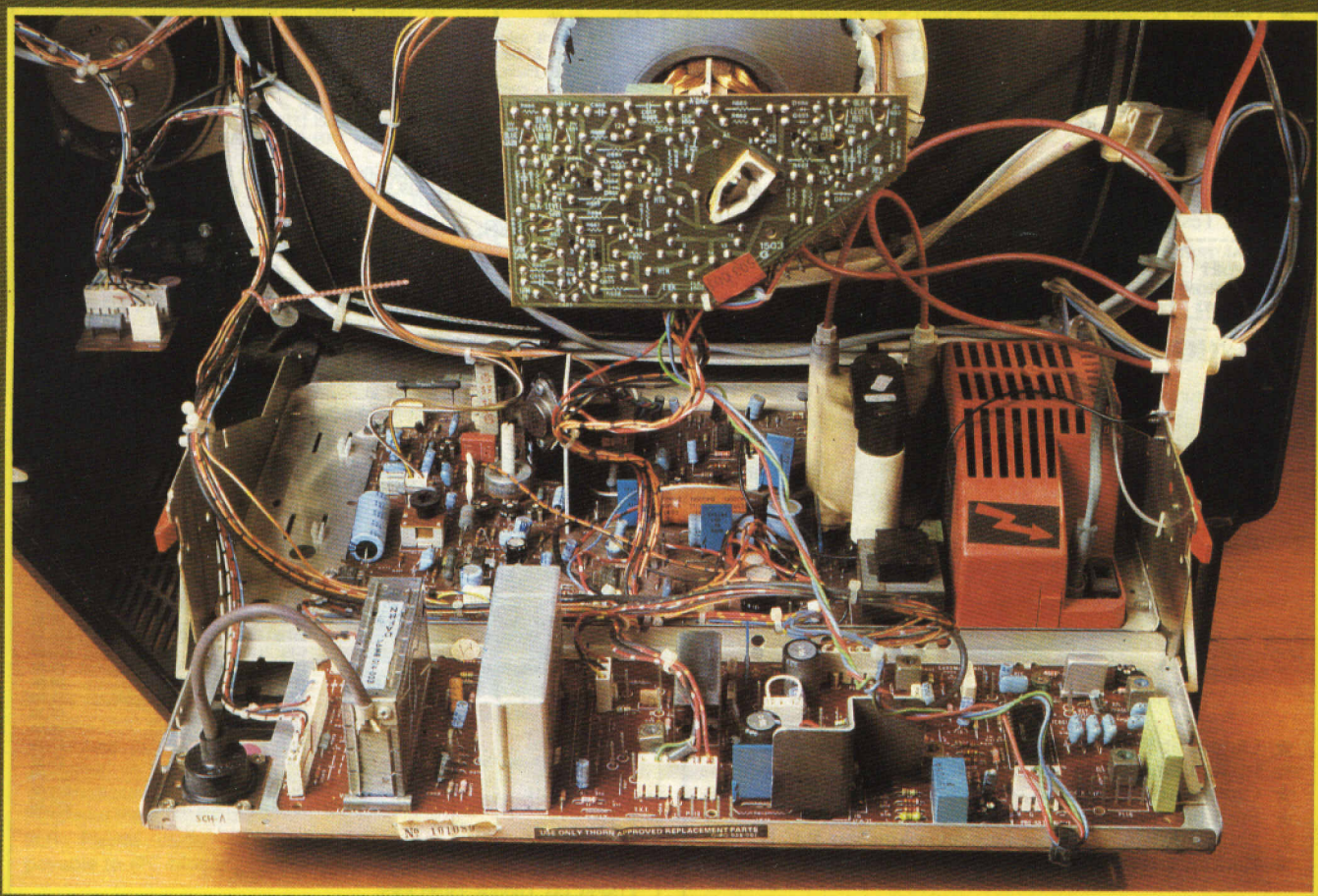
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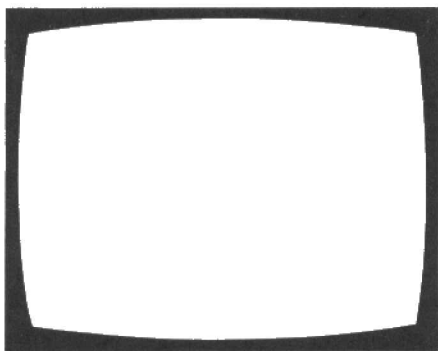
SERVICING·PROJECTS·VIDEO·DEVELOPMENTS

Extra this month

The Celtel Year Planner



Servicing the Ferguson TX10
TTL Logic Probe/Analyser
Practical Guide to Satellite TV
How to Stop EHT Arcing
VCR Clinic • IBC 88 Report
TV Fault Finding • DX-TV



TELEVISION

January
1989

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BACK NUMBERS

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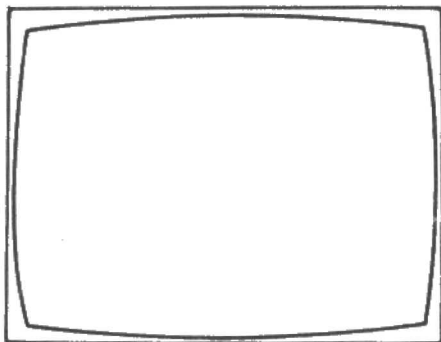
QUERIES

We regret that we cannot answer technical queries over the telephone nor supply service sheets. We will endeavour to assist readers who have queries relating to articles published in *Television*, but we cannot offer advice on modifications to our published designs nor comment on alternative ways of using them. Correspondents should enclose a stamped addressed envelope. Requests for advice on dealing with servicing problems should be directed to our Queries Service. For details see our regular feature "Service Bureau". Send to the address given above (see "correspondence").

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OUR NEXT ISSUE DATED FEBRUARY WILL
BE PUBLISHED ON JANUARY 18



TELEVISION

The Great Gamble

So now we know the government's intentions about the future of broadcasting in the UK, outlined in last month's white paper. They are much as had been predicted, but the more one thinks about the implications the more the whole thing takes on the appearance of being a colossal gamble. Not just by the government with the present arrangements and future possibilities, but also for those companies prepared to take part in the proposed new regime of unregulated broadcasting.

The changes could turn out to be profound in comparison to anything that's gone before. In the past the UK's TV services have evolved in a very orderly manner, with the additional networks as they have come on the scene complementing the services already in existence. The smoothest operation of all was Channel 4. Viewers required no new aerial, tuner or what have you: just push an extra button on the appointed day and there it was. Previous changes had not been quite so smooth. The advent of ITV in the mid-fifties called for a new aerial and maybe an adaptor, though suitable sets had been available for some time in preparation for the day. The ITV companies went through a worrying period initially as advertisers held off before the audience grew to appreciable figures, but the days of the "licence to print money" were not long in coming. The advent of BBC-2 coincided with the plan to move all transmissions to u.h.f. and add colour. Careful planning was the order of the day as the services expanded.

What we have in prospect this time is something quite different. Channel 5 will call for nothing more than a second aerial, but the satellite services will call for a new type of receiving set-up and the latest idea, terrestrial microwave TV, will require a further dish and tuner. The government would like to see all these services in operation by the mid-nineties at the latest – along with Astra's channels of course.

The past expansion of TV in the UK also took careful account of what was likely to be feasible economically – the BBC with its licence revenue, advertising to support ITV, and a carefully worked out method of arranging for Channel 4 to receive adequate revenue. While there is no doubt an unsatisfied demand for advertising slots, and the ITV companies have done quite nicely thank you out of their regional monopolies, it's unlikely that there is enough unsatisfied advertising demand to support all the extra services envisaged. So the public is going to be asked to contribute through subscription payments, while the extra competition will result in reduced rates to capture advertising revenue. No careful planning this time. Push 'em in the water and see who sinks or swims, one problem being that some of the present, acclaimed services could suffer in the process. The past history of UK TV broadcasting can provide no clues as to the eventual outcome if full use is made of the opportunities that will become available in the next two-four years: in addition to BBC-1/2/ITV/Ch. 4 up to 16 Astra channels, five DBS channels, Ch. 5, a suggested sixth and seventh u.h.f. service where it can be squeezed in, twelve or more terrestrial s.h.f. channels plus the cable services.

Freedom of the air is a fine concept; freedom of choice even more so. But it's possible to have excessive choice – you would find it hard to make sensible use of the options when some forty channels are on offer, quite apart from the fact that a plethora of channels does not of itself guarantee a wide choice of programme material.

The new generation of programme providers is not going to have an easy time. Viewers are renowned for their conservative habits. They will have to be persuaded not only to change channels but to contribute to the cost of many of them and to invest in extra receiving equipment. The new programme providers are going to have to show that they have something special on offer, hence all the current bidding for film rights, a hugely expensive business that starts long before any revenue begins to come in. Failures in the broadcasting field have in the past been unknown in the UK, though not elsewhere. Suddenly we have the problems of SuperChannel and its huge losses and Sky's more modest loss-making. Past experience in the USA has been of stations opening and closing while the main networks kept their hold on the majority of viewers.

At the end of the day the question will arise as to whether deregulation will have been worthwhile. At this point one simply cannot begin to try to make an informed guess. The main problem would seem to be that broadcasting revenue will be spread over too many operators and that some current, valued services may not be able to survive in a more stringent commercial atmosphere. The disturbing thing is that the changes are being introduced for ideological reasons rather than strict broadcasting ones. It could be that the only winners will be the Far Eastern manufacturers of hardware.

APOLOGY – COMMODORE SPARES CATALOGUE

Unfortunately the HRS Commodore Computer Spares Catalogue was not available in time for inclusion in last month's issue. It is being distributed with the present issue instead. Our apologies to those inconvenienced by this omission.

PRICE INCREASE

The price of *Television* is being increased to £1.50 from next month's issue dated February. We regret the need to make this increase, which is due to the effects of inflation on the cost of producing and distributing the magazine.

EDITOR

John A. Reddihough

Please note that the telephone numbers below are for contact with the advertisement departments only. Editorial enquiries should be sent to the editor at the address given on page 161.

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CORRECTION

On page 838 of the September issue under the heading Some Quickies Ferguson 3878 should have read Ferguson 3787.

COVER PHOTO

This month's cover photograph shows the Ferguson TX10 chassis – see article on pages 192-5. Note the later, replacement type focus unit on the right.

Letters

DEALING WITH SURFACE-MOUNTED CHIPS

With reference to Nick Beer's article on dealing with surface-mounted devices, I find that to lift each leg in turn rather than cutting the legs off with a knife is the best way. If you cut through the legs you not only destroy the chip but also stand a good chance of breaking the connection pads away from the very fine circuit tracks and causing other board damage. When a knife is run along the line of pins on the side of a chip several times it's all too easy to slip off the end and cut into the board or, as the last cut is made, the legs may twist in the direction of cutting and lift the print. Another problem is that if too deep a cut is made when the legs are cut the tracks that run from the legs and underneath the chip can be severed, something you might find out only after fitting a new chip and discovering that it doesn't work. The equipment I use consists of an anti-static work area, an earthed variable-temperature soldering iron, and a set of three soldering aid tools from RS with the spike tool filed down to a point. Also low melting-point solder, desoldering braid and good lighting.

To disconnect an i.c., first remove as much of the solder from the pins as possible, using desoldering braid with the iron temperature at maximum. Turn the iron temperature down, then insert the spike end between the upright edge of the chip and the vertical section of the first leg – see Fig. 1. Apply slight pressure to the leg, using the chip to lever against, then apply the iron to the outer end of the leg. The solder will melt and the leg will lift upwards away from the board. Move the iron to the outer underside of the inclined leg, heating and bending the leg up farther. This will melt any solder that's still holding the inner end to the pad in a way that avoids peeling the pad from the board. With the leg raised high enough the spike can be moved to the next leg and so on. After removing the chip, clean off any remaining lumps of solder with the iron and braid. I've had no board damage problems since adopting this method rather than cutting chips out. With a bit of practice an 84-pin chip can be removed in a few minutes.

When fitting a new chip I use 22-gauge low melting-point solder to avoid overheating problems. First align the chip, checking that all pins line up with the board print (also check that you have it the right way round!). Start by soldering two legs at opposite ends of the chip to stop it moving. Put the iron's tip vertically on to the outer section of the leg, then dab the solder on to the outer edge – it should flow evenly round the leg.

Soldering each pin individually is o.k. with chips that have wider spaced pins (24 pins etc.) but with larger types (e.g. 84 pins) this is very difficult. It's easier to solder

opposite corner pins as before – to hold the chip – then to solder all the pins of each side by starting at one end and moving both the iron and the solder along the line of pins. What usually happens is that two or three blobs of solder form, each across several pins, rather than a line connecting them all. This doesn't matter as long as all the pins are soldered. It's then just a matter of removing most of the solder with braid, leaving only the solder between the pins and the board.

I've tried using solder cream, which is a mixture of tiny blobs of solder held in suspension within flux. You apply this to the board before placing the chip on it. But what has tended to happen is that any excess solder flows behind the legs. This can cause shorts between them.

To reuse a chip it's just a matter of bending down all the pins so that they are level and making sure that none are twisted out of line.

This method of removal causes least damage to the board and saves the chip, which might not be faulty after all. I recently replaced an 84-pin surface-mounted chip in a CD player only to find that the fault was still present. It was caused by another component, but the replacement chip was also faulty, causing a different set of symptoms. The player worked perfectly when the original chip had been refitted.

I'd be interested to know if any readers use hot-air irons and whether these have any real advantages over the conventional type for this and other work.

*Ian Bowden,
Barnstaple, N. Devon.*

ESTIMATES AND VAT

In his otherwise excellent article on setting up a workshop David Botto has I think slipped up on one point regarding estimates. His idea of fixing an agreed sum below which a repair will be carried out is fine, but to slap VAT on top can be upsetting to the customer. It's just as easy to set the charge at an arbitrary whole number, e.g. £20, and work out the VAT backwards. This is done by dividing by 1.15 (where the VAT rate is 15 per cent) to get the base price, in this case £17.39 plus £2.61 VAT. Few if any customers having entertainment equipment repaired are likely to be VAT registered. I'm sure that if the engineer gives the customer the feeling that he cares about the cost, however high, the customer is more likely to respond favourably.

*John de Rivaz, B.Sc. (Eng.), A.M.I.E.E.,
Porthtowan, Cornwall.*

SIGNALS FOR 405-LINE RECEIVERS

A few further points have occurred to me since writing my articles on keeping vintage TV equipment going.

First, to eliminate moiré patterning with optical standards conversion, simply reduce the height on the monitor until the scan lines just merge. Reduce the camera height by the same amount. Warning: this will put a new scan burn on the camera tube after a period of use, ruining it for normal critical applications.

Secondly, the photos of 405-line pictures in the November issue did not do justice to the original display, which was really excellent, with full resolution and good grey scale. The interpolation effects were reasonably clear however. The picture source was a Marconi BD617 monoscope at the Vintage Wireless Museum.

Thirdly, the Rediffusion tuners mentioned in the article are now also available from Stan Willetts of West

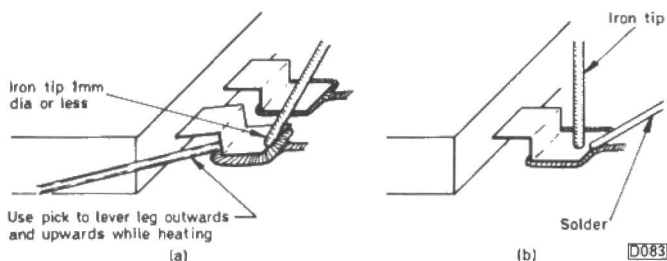


Fig. 1: (a) Unsoldering a surface-mounted chip. Leave each leg bent upwards to enable the pick to reach the next one. (b) Soldering a surface-mounted chip.

Bromwich (see advertisement on page 20 of the November issue). At the price asked it would be economical to buy two of them just to obtain the Rediffusion h.f. modulators, which are the basis of an excellent Channel 1 modulator. A follow-up article describing the modifications required to the Rediffusion units will appear in the February or March issue of *Television*.

It's possible that I will be able to design a digital 625-405 converter over the next year or so. The likely cost of parts, including a PCB, would be in the region of £200 to £300. An interpolator, if this is designed, would add a further £50 to £100, but would be an optional extra. I would like to assess the potential demand, so would anyone interested please write to me care of the magazine? A guaranteed batch size, especially if it exceeded 50, would help to keep the cost down as it would allow bulk purchase of components and PCBs.

Jeffrey D. Borin, B.Sc. (Eng.), A.M.I.E.E.
Harrow, Middlesex.

IMPROVED FIELD FLYBACK BLANKING

I read with interest the article (November issue) by John de Rivaz, B.Sc. (Eng.) on a blanking pulse generator circuit for use in the Rank A823 chassis, having myself had this problem of teletext interference. Others may be interested in the somewhat different approach I adopted to obtaining improved field blanking. I run four of these receivers and derive a great deal of enjoyment from maintaining them and carrying out the occasional modification, such as adding emitter-followers in the RGB output stages to improve the definition. Realignment has been carried out since in some sets, particularly those with varicap tuners, the ex-factory alignment wasn't very good, giving rather poor picture performance. But that's another story.

The field blanking modification I carried out is shown in Fig. 2 and involves alterations on only the c.r.t. base panel. The idea is to increase the amplitude of the field flyback blanking pulse from -40V to -140V. To achieve this 4R3 (220k Ω) is replaced with two 110k Ω resistors as shown and 4VT2 is changed to a high-voltage type such as a BF337. The collector of 4VT2 is disconnected from its previous point (the junction of 4D1/4VT1 emitter): instead the lead is bent round and connected via the

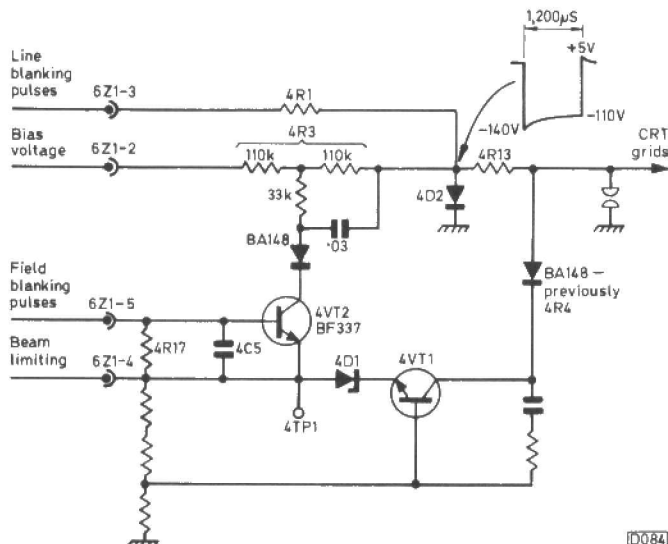


Fig. 2: Modification to the Rank A823 series chassis to obtain improved field flyback blanking. The amplitude of the blanking pulse is increased to -140V.

components shown to the c.r.t.'s grid circuit. After doing this 4R4 must be replaced with a diode. Everything else is left as before – the additional components can be fitted on the component side of the panel.

This modification has been working perfectly in all four sets for some time now, with no sign of the accursed lines. It has the advantage that no connection is made to the signal path and, like the circuit in the article, it doesn't affect the field flyback resonance conditions.

Incidentally, I would be happy to correspond with other like-minded enthusiasts of these old sets.

Colin Doman, 6 Churnet Close,
Bedford, Beds MK41 7ST.

FERGUSON 3V42/3/4 AND EQUIVALENTS

The problem of the take-up/supply poles not reaching the fully laced position in JVC HRD140/Ferguson 3V44 VCRs, mentioned in the December Service Bureau, is a common one on these machines – also the 3V42, 3V43 and the JVC, ITT and Toshiba equivalents. It's caused by the original grease applied to the plastic runners for the take-up/supply poles having become hardened and sticky. For a complete cure all grease should be removed from the plastic runners and fresh grease applied. To do this the video drum assembly has to be removed. This is easily done as it's held in by only three screws. Clean all grease from the locating notches for the poles, then apply fresh grease. Fresh grease should also be applied to the worm gear beside the control motor (part of the mode control assembly).

On the underside of the deck both gears should be removed and their centres cleaned – grease was applied to the shafts on which they are mounted. With these gears removed, the groove in the underside of the mode control assembly can be cleaned and regreased.

The manual contains all the relevant information for setting up the mode control timing. This should be strictly followed when reassembling the mechanism.

Alcohol can be used to remove the old grease. The replacement grease should be a molybdenum-based type.
Alfred Damp,
Ryde, Isle of Wight.

TELETEXT INTERFERENCE PROBLEMS

I've had the same trouble (teletext interference) described by John de Rivaz, B.Sc. (Eng.) in sets fitted with the Rank T20/T22 series chassis and the Philips G8 chassis. With the T20/T22 the problem can sometimes be overcome by adjusting the field output stage bias control, though to obtain a good picture it's often necessary to adjust the field linearity as well. With the G8 the problem has often been associated with other faults, i.e. one of the line output transistors has gone leaky and, to obtain a decent picture, the line output transformer may also need to be replaced.

Rothley Stevens,
Coventry.

USE MANUFACTURERS' SPARES

I feel I must comment on Dave Mackrill's letter (December) regarding the use of a BU208D as the chopper in the Amstrad Models CTV2200/2210. I would seriously question the use of this device, especially as it contains an efficiency diode connected between its collector and

emitter. My policy is to fit genuine manufacturer's approved parts wherever possible, bearing in mind that repairs must conform to BEAB requirements and that in the event of a fire etc. the engineer could be held responsible if incorrect parts had been fitted.

Whilst on this subject I would also recommend using genuine manufacturers' parts when servicing VCRs. I have a large stock of useless belts, idlers, etc. that are pattern parts which will not work, or in some cases belts that bear no physical relationship to the genuine items. In most cases there's very little difference between the price of pattern parts and genuine parts.

So take the trouble to track down genuine parts and stick to manufacturers' recommendations and instructions. This may put a few pounds on the final bill, but the repair will be that much more reliable and your business reputation can only improve.

*S. J. Cain, Valley Electronics,
Holyhead, Gwynedd.*

THE HITACHI VT17

In the October VCR Clinic Mick Dutton mentioned no clock display with the Hitachi VT17, due to absence of the 10V supply on the timer panel. Readers should note that there's an official Hitachi modification for this problem, as follows. Replace Q1795 with either a 2SD468 or a 2SD882 transistor, replace wire link K1788 with a 1S2076 diode (types 1S2473 of 1SS133 can also be used), and add an 0.022 μ F capacitor between pins 4 and 5 of RC1795 (10V generator).

*Jeff Crocker,
Bargoed, Mid-Glamorgan.*

MORE ON THE AMSTRAD CTV2200/2210

I would like to thank Dave Mackrill for his article on the Amstrad CTV2200/2210 (November issue). It was a great help in repairing one of these sets that no one else wanted to know about. The original problem was low, distorted sound. I didn't have a manual but found that R313 (100 Ω) was open-circuit. The sound was o.k. after putting this right.

A week later the set came back dead. I couldn't believe it! The fuse, the chopper transistor, the 27 Ω resistor (R814, 20W) in the feed to the line output stage and the line output transistor had all failed. The capacitor that Dave mentioned had not so far given him trouble, C845 (4.7 μ F, 250V), was short-circuit. So beware of this one! It might in some cases cause tripping.

*J. E. Jones,
Lampeter, Dyfed.*

PANASONIC U2 CHASSIS AND D1 DECK

I think John Coombes (TV Fault Finding, December) must have had the Panasonic TC2205 rather than the TC2207 in mind – the TC2207 doesn't have remote control. D552 is however a trouble-maker in these sets (U2 chassis), usually going short-circuit rather than open-circuit. The associated diode D553 (BY299) then very often suffers. The EW modulator driver transistor Q753 (BD237) can fail, usually when the diodes have done so, resulting in EW pincushion distortion. D552 should always be replaced with a Panasonic type – I've seen BYX71-600 or BY223 diodes fitted in this position but, as in other Japanese sets, their long-term reliability is poor.

In the same issue Eugene Trundle mentions (VCR Clinic) trouble with the mode switches in the Panasonic D1 deck. A point worth making here is that it's worthwhile changing the securing bolt at the same time to prevent callbacks. Also VS0110 is not the only switch in use: the G7/10/12 use the VSS0135 while the NV830 uses another type again.

An extremely common fault with these decks is a knocking noise during reel movement. In some cases this can be caused by a dent in the VXP0521 idler (as in BSR turntable wheels!) but more commonly the cause is the VXP0600 reel clutch. We find that about 75 per cent of the machines that come in have this problem in varying degrees.

*Nick Beer,
Bideford, N. Devon.*

KEEPING 405-LINE TV ALIVE

Jeffrey Borin's articles (November and December) were much appreciated by the growing number of enthusiasts who are doing their best to keep 405-line TV alive.

The Rediffusion units mentioned make an ideal modulator. I've now built two of them: both worked first time, with absolutely no tuning or fiddling.

Most people seem to use VHS tapes for storing programme material. There's an urgent need to co-ordinate library material – I'd be pleased to hear from anyone who wishes to exchange some. Meanwhile I can supply tapes of test cards C and D as well as various tuning signals and apology messages.

It's important that 405-line enthusiasts should keep in touch with one another. The ideal means is through the British Amateur Television Club, mentioned by Jeffrey, which has been promoting home-generated 405-line TV since 1949 – yes, forty years!

*Andy Emmerson, G8PTH, 71 Falcutt Way,
Northampton NN2 8PH.*

SONY SLC5/6/7 – CAPSTAN LOCK PROBLEM

I noticed the mention of loss of capstan servo lock (VCR Clinic, December) as being a common problem with Sony SLC5/6/7 VCRs. By coincidence I happened to be working on an SLC6 at the time, the symptoms being that the capstan was running slow with the speed control unable to provide sufficient correction. After much checking and head scratching, including replacement of the capstan servo chip IC1, I discovered that the defect was due to C8, an 0.22 μ F electrolytic capacitor whose value had increased to 0.31 μ F. As C7 is the same type I checked this as well and found that it measured 0.32 μ F. After replacing these capacitors and resetting the capstan free-running speed, which was then too fast, the machine operated correctly. So maybe this could be the component ageing fault suggested.

*S. Herman,
Stanmore, Middlesex.*

FOR DISPOSAL

I have available free to individuals a quantity of T41 valves, brand new and boxed. They were used as timebase generators (thyatron) in many early TV sets. I also have quite a few 90CV valves, again free to individuals. In turn I'm looking to buy Labgear or Teldis upconverters.

*Douglas Biggar, 27 Auld Lea Road,
Beith, Ayrshire KA15 2DA. (Telephone 050 55 2118).*

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TOSHIBA V9600	£25.00
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A TTL Logic Probe/Analyser

Stuart Anderson, B.Ed. (Hons.)

When building or servicing logic circuits it's of considerable advantage to have a piece of equipment that will readily reveal the logic state at any given point in the circuit. It's also useful if the unit can not only indicate logic one or zero but will also indicate whether or not a point is floating, i.e. not connected to anything at all.

The operation of the unit to be described relies upon two main factors: (1) the tri-state nature of the exclusive-or logic gate (to be described later) and (2) the fact that the inputs to TTL gates rise to the logic one state when they are left unconnected.

Basic Gates

Before considering the probe circuit in detail it's relevant to take a look at basic logic gates. A logic gate performs a certain action under specified conditions, its output being totally dependent on the input(s).

The simplest logic gate is the not gate (inverter). Its output is simply not its input, hence a logic one input produces a logic zero output and vice versa. Fig. 1 shows the circuit symbols used and a simple single transistor implementation.

The nor gate is really a two-input not gate. Its output is high when neither input is high, i.e. when neither A nor B (see Fig. 2) is high.

The or gate is simply the inverse of the nor gate, see Fig. 3. Its output is high when either input, A or B, is high. The output is also high when both inputs are high. As the two-transistor circuit shows, the or gate is a nor gate followed by an inverter.

The output from an and gate (Fig. 4) is high only when both inputs are high, i.e. A and B must both be high.

The nand gate is the inverse of the and gate: it gives a logic zero output when both inputs are at logic one. Fig. 5 shows the symbols.

We have not shown simple transistor circuits for the and and nand gates. This is because they can be made up from the or, nor and not gates previously described. This is useful because it means that gates can be connected together in order to carry out different functions. This is known as combinational logic.

Combinational Logic

At this point two important rules concerning logic gates can be stated: (1) any logic gate can be constructed using only nand or nor gates; (2) a nand or nor gate with its inputs connected together becomes an inverter.

The simplest example of how nand gates can be used to implement a different gate is that of the and gate: as Fig. 6

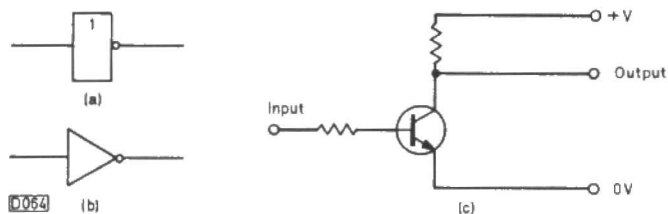


Fig. 1: The not gate. (a) Latest BS symbol. (b) Conventional symbol. (c) Single transistor implementation.

shows, the and function can be obtained simply by inverting the nand function.

A more complicated piece of combinational logic is shown in Fig. 7. Careful analysis of this circuit will show that it provides the nor function. You might ask why it might ever be necessary to use four nand gates in this way

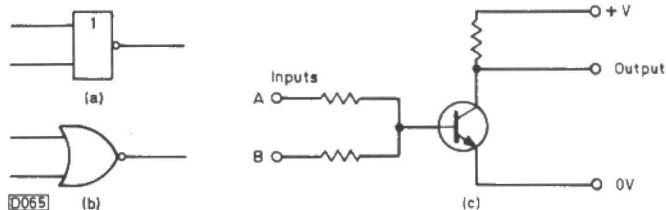


Fig. 2: The nor gate. (a) Latest BS symbol. (b) Conventional symbol. (c) Single transistor implementation.

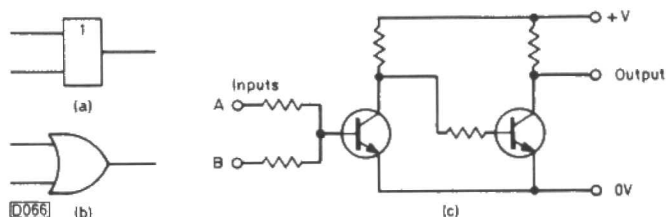


Fig. 3: The or gate. (a) Latest BS symbol. (b) Conventional symbol. (c) Two transistor implementation.

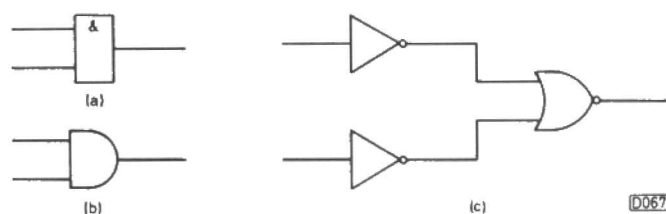


Fig. 4: The and gate. (a) Latest BS symbol. (b) Conventional symbol. (c) Implementation using two not gates followed by a nor gate.

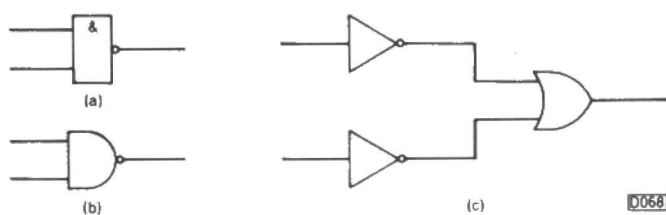


Fig. 5: The nand gate. (a) Latest BS symbol. (b) Conventional symbol. (c) Implementation using two not gates followed by an or gate.

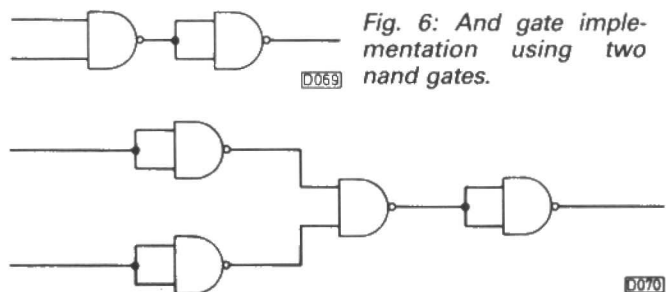


Fig. 7: Nor gate implementation using four nand gates.

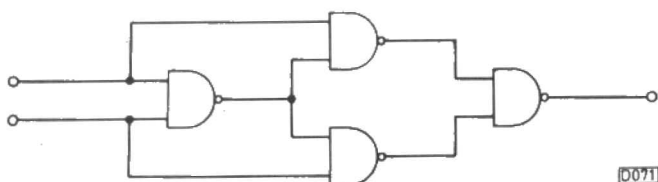


Fig. 8: Exclusive-or gate implementation using nand gates.

Not gate			Nor gate			Or gate		
In	Out		A	B	Out	A	B	Out
0	1		0	0	1	0	0	0
1	0		0	1	0	0	1	1
			1	0	0	1	0	1
			1	1	0	1	1	1

Fig. 9: Truth tables for logic gates.

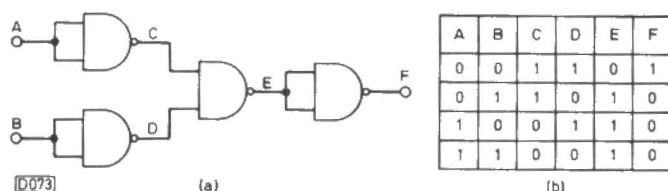


Fig. 10: Analysis of nor gate implementation using nand gates, (a) circuit, (b) truth table.



Fig. 11: Exclusive-or gate symbols, (a) latest BS, (b) the conventional symbol.

instead of using a single nor gate. There are two answers to this. First, in a more complicated logic circuit design several gates may be left over – gates are usually packaged in i.c. form in groups of four. Thus spare gates can be used to implement other gates required. Secondly reduction to nand gates can be used for minimisation, i.e. you might find that in a very complicated circuit two inverters follow each other and can thus be eliminated.

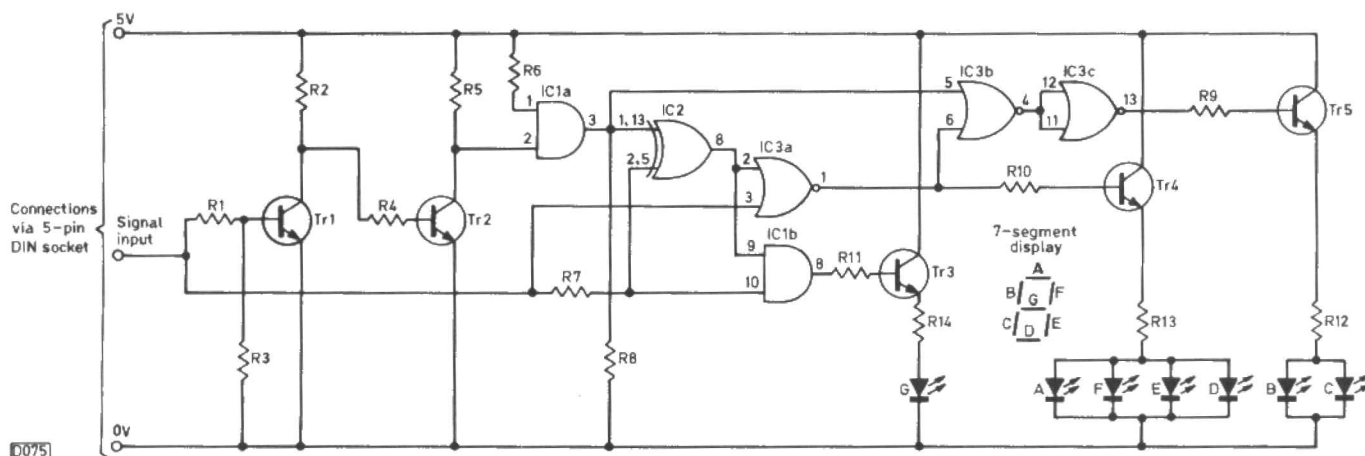


Fig. 12: Circuit diagram of the logic probe/analyser. Note that the nor gates IC3b and c are used to implement the or function, while IC2, a 7400 quad nand gate, implements the exclusive-or function.

Fig. 8 shows another example of combinational logic. Four nand gates are once again used, but in a different configuration. In fact we have here a completely different gate, the exclusive-or gate. It provides a high output when either input is high but not when both inputs are high. The best way to see how it achieves this is to draw up a truth table. Truth tables show the output state for all possible input state(s). Thus the simplest truth table is that for the not gate (inverter) which has only two rows and two columns – see Fig. 9 where the truth tables for the gates described so far are shown.

Fig. 10 shows how the truth table for the nor gate conditions is obtained with the circuit shown in Fig. 7. The first two nand gates are connected as inverters, so that their outputs at C and D are the inverse of the inputs at A and B. The third gate performs the nand function whose conditions are listed in columns C, D and E. The fourth gate again provides inversion, its output being shown in column F. To see the actual function provided by this combination of gates, refer to columns A, B and F of the truth table: these represent the nor function.

With this kind of analysis it can be shown that the exclusive-or configuration shown in Fig. 8 provides the truth table shown in Fig. 9. Fig. 11 shows exclusive-or circuit symbols.

Circuit Description

The exclusive-or gate is of particular interest to us since it forms the heart of our logic probe. The exclusive-or gate has a tri-state nature, though this must not be confused with a real tri-state device. These can be used as buffers whose outputs take up a logic one or zero state or a high-impedance output condition. They can be used for example in data lines in microprocessor systems. In the present context tri-state means that there are three variables associated with the input and output logic conditions. The significance of this is that since the output is logic one in accordance with the or function and zero in accordance with either the nand or the or functions we have, in combination with other gates, the three output possibilities required for our logic probe.

Fig. 12 shows the circuit diagram of the probe. We can now examine its mode of operation.

Although ready-made exclusive-or gates are available the function has been implemented using a 7400 quadruple nand gate (IC2). This readily available device costs no more than an exclusive-or gate and takes up no more space.

The probe input is fed to the two-transistor buffer Tr1 and Tr2 and also to pin 3 of the nor gate IC3a. It is also connected via R7 to pins 2 and 5 of the exclusive-or gate IC2 (7400) and pin 10 of the and gate IC1b. Thus all these pins take up the value of the input.

Let's assume first that the input is a logic one. Pin 1 of and gate IC1a is always at logic one since it's connected via R6 to the 5V line. Pin 2 will become logic one via the transistor buffer, so pin 3 will also be at one. This output is connected to pins 1 and 13 of the exclusive-or gate IC2. Under these conditions both inputs to IC2 are at one and its output at pin 8 is zero. Thus one input of nor gate IC3a is at zero and the other at one, so its output at pin 1 is zero. One input of and gate IC1b is at zero (from pin 8 of IC2) while its other input is at one, so its output is at zero. Finally, pin 3 of and gate IC1a is connected to pin 5 of the or gate made up from nor gates IC3b/c whose output at pin 13 rises to one. Thus Tr5 conducts and the seven-segment display indicates one.

If the probe's input is logic zero, a similar analysis will show that IC1b gives zero output while the outputs from IC3a and IC3b/c are at one. This gives a zero indication.

If there's no input at all, pin 2 of and gate IC1a is at zero since the input to the transistor buffer is connected to the negative side of the supply via R3. Pins 2 and 5 of IC2 and pin 10 of IC1b will rise to logic one however. Following through the rest of the logic you can see that the only high output is at pin 8 of IC1b. Thus only the central portion of the seven-segment display lights up, indicating a floating input. Pin 3 of IC1a is connected to the negative side of the supply via R8 to prevent it rising to logic one in the absence of an input signal.

These logic sequences are summarised in Fig. 13, where Z indicates a floating input.

Construction

The probe can be built on a Veroboard strip or a printed circuit board can be made. In my opinion the use of Veroboard is simplest, so we'll describe this first.

The prototype was built on a piece of Veroboard less than 10 × 6cm (36 × 24 holes). Fig. 14 shows the method of implementing the exclusive-or gate using a 7400 i.c.

Components List

R1	2.2k	R6	1k	R11	22k
R2	1k	R7	2.2k	R12	33Ω*
R3	1k	R8	47k	R13	22Ω*
R4	15k	R9	4.7k	R14	68Ω*
R5	2.2k	R10	10k		

Tolerance and power ratings are not critical. All resistors could for example be 10%, 0.5W.

*See text.

Tr1-5	BC108 or equivalent
IC1	7408 quad and gate
IC2	7400 quad nand gate
IC3	7402 quad nor gate

Maplin 0.3in FR38R or 0.5in FR41U seven-segment displays are suitable.

Maplin LH14Q plastic box was used for the prototype.

5-pin DIN plug and socket, crocodile clips plus Veroboard or PCBs. Prototype used 10 × 6cm and 4 × 3cm boards.

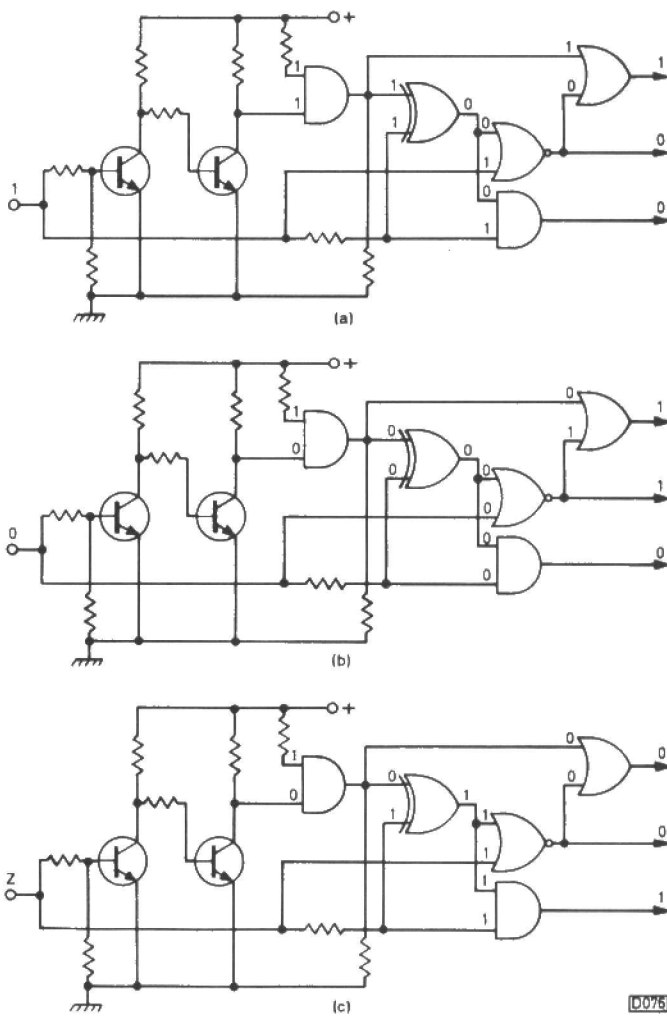


Fig. 13: Analysis of the logic probe conditions (a) with logic one input, (b) with logic zero input and (c) with a floating input.

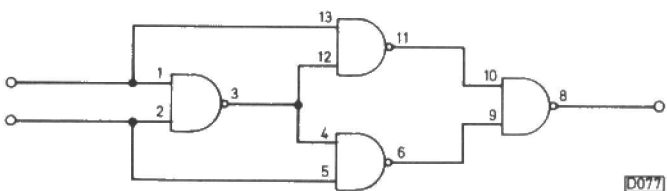


Fig. 14: Exclusive-or implementation using a 7400 chip containing four nand gates.

The inputs are pins 1/13 and 2/5 while the output is pin 8. The method of connecting the 7402 chip to implement the or function is clear from the circuit diagram.

Fig. 15 shows an outline layout as used in the prototype while Fig. 16 shows the completed circuit. The seven-segment display and its associated limiting resistors R12/3/4 are mounted on a separate piece of Veroboard with connections to the main board via wires. The size of the seven-segment display is a matter of choice, but the design assumes the use of common cathodes. With a small display size R12 is 18Ω, R13 10Ω and R14 33Ω. With larger displays, e.g. half inch, these values should be approximately doubled (see components list).

Fig. 17 shows a suitable PCB design if this is preferred while Fig. 18 shows a layout for the display.

Nine wire links or jumpers are required. It's probably best to fit these first since two are underneath i.c.s. Fitting the links is no problem if i.c. holders are used and this is generally to be recommended. It's even easier if i.c.

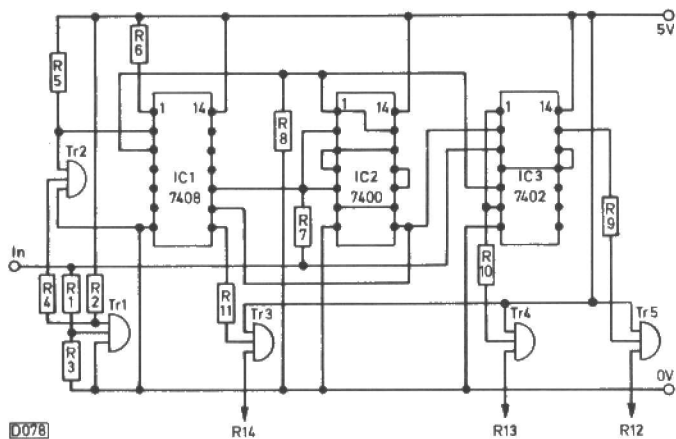


Fig. 15: Outline layout for construction using Veroboard.

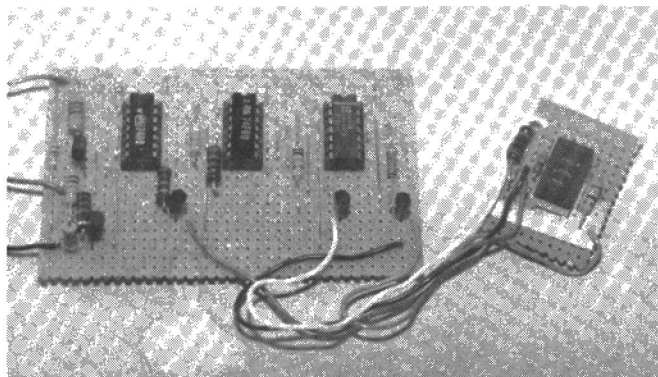


Fig. 16: The completed unit, built on Veroboard.

socket strip is used as there is no plastic base in between. These strips are very versatile and there is no waste.

After fitting the links and i.c. holders, fit the five transistors then the eleven resistors. The seven-segment display panel can then be made and the two linked together with colour-coded wires.

Once these operations have been completed the i.c.s can be slotted into place and the unit tested. This can be accomplished simply by connecting a 5V supply. With no input only the central segment of the display should light. One and zero should be displayed when the input is connected to 5V and 0V respectively.

If the checks prove satisfactory the unit can be housed. The prototype was incorporated in a box measuring $11 \times 7.5 \times 3$ cm. Holes for the display and a five-pin DIN socket were made in the lid, these items being bolted in

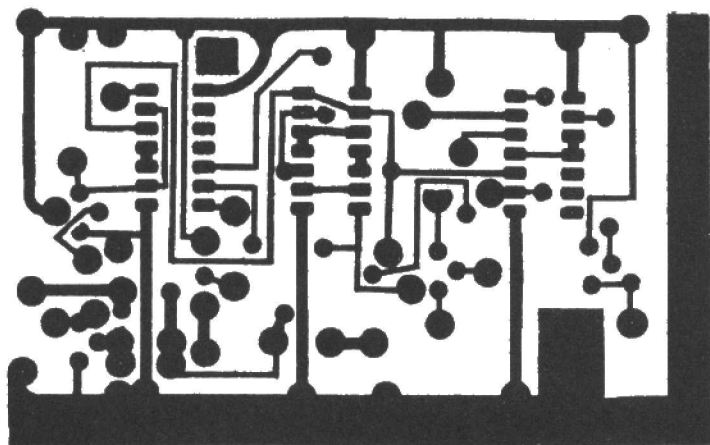


Fig. 17 (left): PCB layout for the logic unit. Scale 1:1.

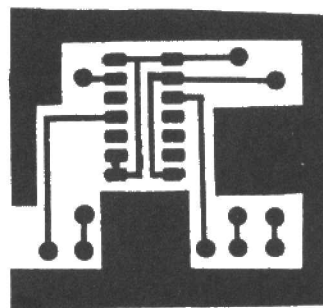


Fig. 18 (right): PCB layout for the display unit. Scale 1:1.

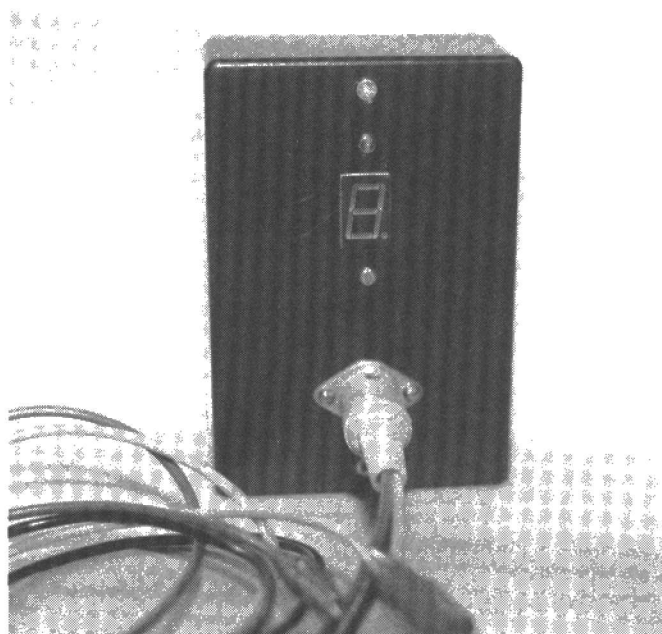


Fig. 19: The completed unit in its case.

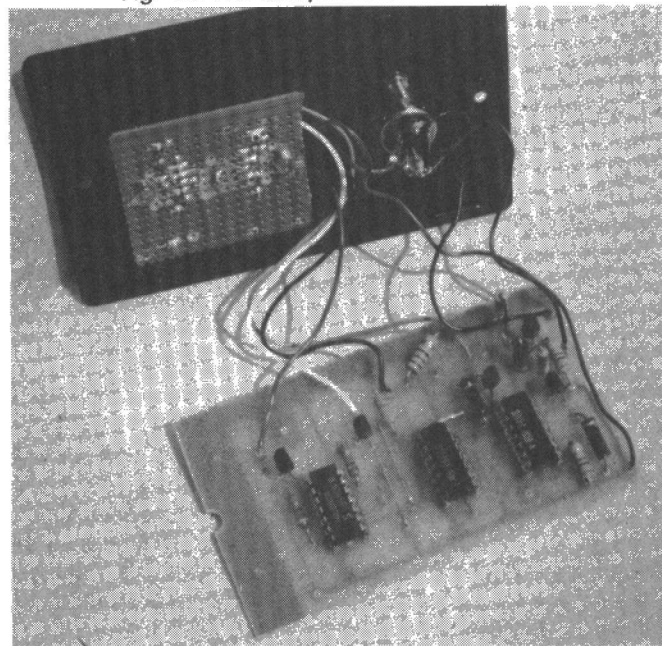


Fig. 20: Internal view of the completed unit.

place. The probe was made from an old meter probe, the other connections being made via standard crocodile clips. These details can of course be varied to suit individual requirements.

Camera Workshop Accessories

Nick Beer

Servicing cameras and camcorders is a specialist business that should be tackled only by those equipped and competent to do so. The increasing number of cameras and camcorders now on the market means that few dealers will not come into contact with them.

A considerable investment is required to set up a complete camera/camcorder workshop. As a result, many people fall into the trap of attempting repair and alignment without any form of aid. If you have a technically competent staff (and a VCR engineer does not automatically qualify as a camera engineer) but your camera turnover does not justify spending several thousand pounds on a workshop, a usable servicing area can nevertheless be constructed without immediate need for that most expensive item of camera test gear the vectorscope. The camera workshop should however be in a separate room which is whited out, and rather more stringent rules of cleanliness than in the average TV workshop should be observed. Accurate lighting of a specific intensity and temperature is required — obviously alignment calls for a standard.

In addition to the usual workshop equipment — scope, meter, etc. — the accessories mentioned in this article are required. Operation along these lines should provide a workable alternative to a dedicated camera/camcorder servicing department. If you cannot justify this amount of effort your camera servicing should be subcontracted to someone with the necessary facilities.

Alignment Charts

Most camera head alignment is based on the use of viewing charts. These are viewed under accurate lighting conditions. It's important that both the charts and lighting are accurate. Some service manuals, notably those produced by Panasonic, include some very basic charts to check linearity and focusing, but the most important charts are those required for alignment of the vision circuits.

The first of these is a colour-bar chart. This is self-explanatory, usually resembling the pattern produced by your current pattern generator. A quick check with various manufacturers indicates that the average price of such a chart is in excess of £100 — this may come as quite a shock for a single chart. We have some good news on this score however — see later.

Secondly comes a logarithmic grey-scale chart. This consists of a series of accurately painted grey bars from white to black and black to white. This is again used for white balance alignment. It tends to be even more expensive — typically around £150.

A resolution chart provides a way of determining focus accuracy and the horizontal resolution of the pickup device/camera head.

Another type of chart is used to align camera geometry. It comes in several forms but basically consists of a crosshatch pattern and a circle.

Obviously the total cost of a set of charts could be considerable. Now for the good news: PAG Ltd., Video Division, 565 Kingston Road, London SW20 8SA (telephone 01-543 3131) has available a set of charts consisting of colour bars, a logarithmic grey scale, resolution and

registration patterns in a sturdy folder at a trade price of £94 plus VAT. They are of superb quality, presented in a folder with a calibration slip and instruction leaflet. Representing a massive saving, they are thoroughly recommended. These charts have a laminated finish to enable them to be cleaned. The firm also has a series of matt finish charts of US origin available. These can be bought separately and are somewhat more expensive. A shiny surface is no problem with diffused lighting.

Illumination

The charts are normally positioned about 2m (depending on chart size) from the front of the pickup device. They should be on a flat, level, perpendicular surface — as should the camera under test.

The level of illumination required varies with different manufacturers. Typical values are 1,400 and 2,200 lux (3,200°K). The illumination must be very even, with no other light sources (from a window for example) affecting the chart area. The most practical way to achieve this is to paint the whole area white — matt to avoid reflections.

There are several sources of the required light. We use a 1,000W tungsten halogen unit from RS. Aico International, the camera accessories firm, do a fan-cooled 1,000W Braun unit that's suitable and is not expensive. To vary the light level at the chart you can incorporate a dimmer or physically move the light. Either way you will need a light meter to set the level.

Light Meter

Again, RS have a suitable unit. As you would expect, it's well built and comes with a carrying case and strap. The light sensor is separate from the meter itself, connected by a small lead. It sits in the top half of the case, being strapped in. According to the instruction leaflet you can use the sensor in this position, but since the strap runs through its centre some of the light is blocked, giving a slightly low reading. We found the best approach to be to lift the sensor out and sit the meter on a nearby bench, making use of the amply long lead. The meter is battery powered (one PP3 battery), is guaranteed for a year and is covered by the RS repair/exchange service (for the appropriate fee).

Those determined to do the job without the equipment and expertise required — there will always be a few — will probably be saying that they can use their stills camera light meter. This is not the same thing however. When we tried a couple against the RS one we found that there were inaccuracies.

The RS meter has four ranges, 50, 250, 500 and 2,500 lux f.s.d., also a battery test. Its order number is 610-815 and the trade price is £135 plus VAT. We found it to be ideal for use in our camera workshop and thoroughly recommend it. A $\times 10$ neutral density filter is available at £53.50 trade plus VAT, order number 610-821.

This concludes my round-up of the accessories required for camera servicing. Finding supplies of, in particular, the charts can be difficult, so I hope this piece may save you some time and money. Thanks are due to Steve Beeching, T. Eng., for his assistance.

How to deal with EHT arcing

Nick Beer

The problem of e.h.t. tracking, arcing or flashing – call it what you will – comes up from time to time in these columns. The thing that concerns me is the way in which some “engineers” deal with it.

The trouble usually arises because of breakdown of an insulator, maybe the e.h.t. or focus lead, the tripler or line output transformer casing, or the e.h.t. cap itself. Particularly in the latter case damp, condensation and dirt are well known contributory factors: the e.h.t. tracks along this resistive path and the resulting heat causes damage to the cap, thus making the problem worse.

Initial Steps

When confronted by an e.h.t. problem the first thing to do is to switch off and discharge the c.r.t., if it has remained charged (obviously the tube will be discharged if the leak is large enough). The correct way to do this is via a large resistance to the Aquadag earth strip – a convenient method is to use the e.h.t. probe you employ with your meter. Unfortunately many people still discharge to the metal chassis, then wonder why the set has a fault it didn't have previously – remember that most chips operate with a supply of between 5V and 12V!

Once you've established that the tube is discharged, examine all the suspect areas – obviously if you saw a flash from the tripler's case you needn't look much farther for

the fault, but whenever you have a flashover the cap, tripler and line output transformer cases, the e.h.t. leads, the focus potentiometer and spark gap and the area of the c.r.t. surrounding the e.h.t. rose should be checked. If there are any signs of perishing, tracking, cracking, cuts or other damage the item concerned should be replaced.

EHT Caps and Leads

The most common thing to fail is the cap itself. Many people just pour on sealer or silicone grease until the arcing quietens down, only to find themselves facing the set again days later. Unless it's perfect, an e.h.t. cap should always be replaced. Many people seem to be unaware that separate caps are available from suppliers, e.g. the HRS EHTCAP1 at 59p + VAT, the Willow Vale 03425 at 74p + VAT and the SEME ANODECAP at 99p + VAT (one off prices). Thus from the price point of view it's not worth thinking twice before changing a cap.

Before you do so, the rose of the tube should be scrubbed: the best fluids for the job are methylated spirit, RS solvent cleaner or RS aerosol demisting lubricant (purple squirt as we call it). Use a rag to remove all dirt, rust and moisture from the area. When you've finished, remove all traces of the fluid. The cap should then be pressed home so that it's a tight fit – adjust the clips if it's slack – and the lead routed as it should be, clipped and

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tied correctly.

Another thing that can be overlooked when a cap is replaced is the series resistor (if one is fitted). If at all possible, save the original one. It's usually fitted in the neck of the cap, so bear this in mind before removing the old one.

Finally on the subject of caps don't smother them with silicone grease, rubber or other gunges. This will only attract muck and start the problem up again. Look at a new set: it doesn't have gunge around the cap does it?!

Leads from diode-split line output transformers are another favourite for this kind of trouble – I think of Philips, ITT and B and O sets in particular. The leads usually plug or push into the transformer at one end, with the cap on the other end. Again, replace the lead if you are in the least bit suspicious. Don't do what I've seen done – the lead taped up or a section cut out. Remember that the leads are tuned lengths, and again usually have a series resistor. It's perfectly in order to fit a new cap to one of these leads so long as the rules outlined above are observed.

Triplers and LOPTs

If the case of a tripler or line output transformer breaks down the action required is replacement without question, not as some people would have it a quick squirt of plastic

seal over the fracture. These items are critical to safety. The cost of replacement may be high, and this could mean writing a set off and loss of a repair job, but is this worse than being sued for damages when the customer's house burns down as a result of the economy repair? Don't say this won't happen – it has.

Plastic Sealing and Silicone Rubber

I am absolutely against the use of plastic sealing material in e.h.t. areas: it just seals in the fault which will reappear soon. As an aside however I would recommend the use of plastic sealing as the perfect solution for noisy transformer coils, transducers and suchlike – forget wood glue and rawlplugs or whatever else you might use. This is far and away the easiest and cleanest as well as the most effective way of silencing wound components, but always allow plenty of time for the sealing to set before switching the receiver on again.

Silicone rubber, which again shouldn't go within a mile of e.h.t. areas, is perfect for repairing VCR fronts where the buttons that are hinged by the elasticity of the plastic have snapped, usually necessitating replacement which is expensive.

If you're thinking what a load of rubbish this concern for correct action is, just remember Denis Mott's article on "The Legal Aspect" (July 1988).

Still Confused

Les Lawry-Johns

I'm still confused but people keep asking me to do things they can't do. Like the Decca set that came in yesterday. The owner asked if he could stay as he lives a long way from here.

Trouble with Triplers

As it was tripping I started by disconnecting the tripler. This stopped the tripping so I told him how much it was going to cost him. He agreed and I reached for the last new universal tripler. I didn't get it down but instead I looked at the one fitted. As it didn't have a diode lead I decided to fit a spare Philips G8 tripler which was next to the universal one. This was duly fitted and connected – as the e.h.t. lead was a bit short it had to be fitted with the chassis lowered. I then switched on. The sound boomed out and I waited for a picture to appear. And waited. I turned up the brightness. Still no picture.

I checked the e.h.t., which was present, so I moved to the tube base voltages. No first anode supply. Something stirred in my befuddled mind. I cut the mauve lead at the bottom of the right side panel, intending to try an alternative supply. Big sparks came from under the line output transformer, so I hurriedly reconnected the cut lead. There was no model number on the rear cover but I was pretty certain it was an 80 series chassis, so I looked up the circuit, aware that I'd done this only a short time ago. There's no separate rectifier diode for the first anode supply. I then recalled that last time I'd changed the tripler I'd fitted a universal type with the diode and earth leads connected.

So I reached up for the last universal type and hurriedly

fitted it. A picture appeared, too bright because I'd turned up the first anode controls. I turned them down and then turned down the colour to set up a good black-and-white display. Having done this I turned the colour up and the customer commented that it was the best picture he'd seen on the set. I apologised for the delay and he continued:

"You ought to be working in a government factory experimenting with things that won't go right . . ."

He paid up and departed and just at that moment Rick Kinslow drew up in his car. In his hand he had a tripler that looked like the one I'd just changed.

"Have you got a tripler for a Decca Les?"

"I've just used my last one."

He looked up on the shelf. "There's one" he said.

He took down one that I'd taken to be another type, but I could see the difference.

"Take it and try it" I said, ashamed of myself for not having seen it. All the trouble I'd brought upon myself for not looking properly. Oh well.

Processions

I then had to cross the road to post a letter. Half way across I was amazed to see an army of ants marching down the road in perfect step, carrying banners.

"What's that on the banner?" I asked.

The ant carrying it looked up and angrily snapped "it's God of course".

"But it looks like an ant to me."

"Of course it does. What do you think God looks like?"

"Well", I faltered, "God made man in His own image".

"What do you mean His own image? You've given Him a gender!"

"Those males always do" a female ant shouted. "They think they're God and they could well destroy our planet within a few years. Why doesn't their God stop them?"

I ran over to the post box, a bit fed up with these processions that keep coming by. They'd gone by the time I got back.

Teletopics

THE WHITE PAPER

The government's white paper on the future of broadcasting in the UK was published a few days after our last issue went to press. The main proposals about TV broadcasting are as follows. ITV to be known as Channel 3, with ten-year licences going to the highest bidder after a process of vetting. The IBA and the Cable Authority would be replaced by an Independent Television Commission which would be responsible for all commercial TV including cable and satellite broadcasting. While being responsible for licensing and laying down programme requirements it would not be concerned with detailed programme scheduling. The BBC to lose one of its channels during the night-time hours and be subject to a licence revenue squeeze to encourage it to seek alternative ways of raising revenue. Its other channel to be retained for night-time broadcasting only if used for subscription services. Channel 5 to be established as a national service reaching some seventy per cent of the population by 1993, financed by subscription and advertising. Broadcasters would apply for time segments. Viewers would require a separate aerial with probably different polarisation. The main area where a Channel 5 service will not be possible, due to interference problems with Continental stations, is along the south coast. The two unallocated DBS channels to be made available at an early date. In fact the franchises are to be advertised by the IBA this January and services could start in 1990, within a year of the start of BSB's three DBS channels. BSB and Virgin are amongst the organisations that have already expressed an interest in bidding for the two channels. Following a study that has confirmed its feasibility, local MVDS (microwave video distribution systems) TV services are to be encouraged — local in the geographical rather than the programming sense. The feasibility study carried out for the Department of Trade and Industry by Touche Ross Management Consultants confirmed that an extra twelve national channels could be made available to viewers in this way within two years, so terrestrial microwave TV might be with us by 1991, probably in the 12GHz band. The 2.5GHz band is believed to be too crowded while the technology is not yet available to use the 30GHz band. The study emphasised that MVDS would be cost competitive with other methods of broadcasting.

The suggestions contained in the white paper remain for the time being as proposals, and a great deal of debate on them is expected during the early months of 1989. A government bill implementing the proposals is expected to be put before parliament in late 1989 or early 1990.

ASTRA

Following the successful launch of the French TDF-1 TV satellite, Astra is due for launch on December 9th. W. H. Smith Television has signed a multi-million pound contract to lease two of Astra's transponders for its Lifestyle and Screensport channels. Transmissions will initially be to the PAL standard, changing to D-MAC with Eurocrypt scrambling in mid-1989. Financing will be by both advertising and subscription.

A number of manufacturers have announced plans to launch equipment for the reception of Astra transmis-

sions. Of particular interest is Toshiba's plan to market a PAL-only, upgradeable receiver in March: purchasers will be able to have their receivers upgraded for PAL/D-MAC operation by buying an add-on unit. A PAL/D-MAC receiver with the full range of broadcast hi-fi, text and digital enhancements will be released by Toshiba in October.

Rupert Murdoch's Sky Television is to add a fifth channel to its Astra TV services. Sky has set up a joint venture with the Walt Disney Company to make available as a subscription service costing viewers £12 a month Sky Movies and The Disney Channel. The latter will be operated by Disney and will provide 18 hours of programming daily. A smart-card system is to be used for this service. Subscribers will be sent a card — similar to a credit card but incorporating some electronics — to enable their decoders once a month or quarterly. Scrambling is to start on September 1st, before which the channels will be available free.

Robert Maxwell plans to lease two transponders on Astra for the MTV-Europe pop music service and a news and information channel.

Satellite Supplies Ltd. (234 High Street, London NW10 4TD — telephone 01-961 1346) will be supplying a complete TVRO package for reception of the Astra transmissions from February. The Sakura system features a twenty-channel memory and infra-red remote control at a trade price of £160. It's upgradeable for MAC via a five-pin DIN socket.

Tatung is holding a countrywide series of satellite workshops to prepare dealers for the new TV services. Further information is available via the Tatung dealer hotline 0952 290 111 ext. 251.

SATELLITE TV

BSB is to pay over \$160m for the exclusive right to broadcast some 175 feature films owned by Columbia pictures. The company previously concluded other, smaller deals with Cannon, Warner, MGM-UA and a new company set up by David Putnam. BSB is to ask its investors for more money to cover the cost of securing these film rights. A second round of financing this summer is expected to raise £500-£600m instead of the originally planned £400m.

SuperChannel has been placed under court-appointed administration. The Italian company Beta Television (Videomusic TV) which took a majority interest in the channel last month has announced that SuperChannel's debts and liabilities for future commitments are greater than expected.

The Department of Trade and Industry has awarded licences to six companies to provide satellite information services, including TV, to closed-user groups, e.g. betting shops, securities houses etc. Licencees include BSB, Maxwell Satellite Communications and British Aerospace.

The IBA has announced that its two eight metre dishes which will provide the uplink for the DBS services are now in position at Chilworth, Southampton. Acceptance tests have started.

SATELLITE TV BOOKS

Swift Television Publications, 17 Pittsfield, Cricklade, Swindon, Wilts SN6 6AN has just published at £8.95 the *Satellite Television Installation Guide* by John Breeds. This well produced and extensively illustrated book provides a thorough, practical guide to installing satellite TV equip-

ment. Footprint contours for the main European satellites are included along with dish setting up angles covering the whole of the UK. There's a very helpful glossary at the end. The book has been adopted by the Confederation of Aerial Industries for trainees on CAI courses accredited by the City and Guilds of London Institute.

All You Need to Know about Satellite TV by S. Guest-Lee at £2.99 is a well-produced book intended for the general public. It's available from Satellite TV Publications, 79a Bournemouth Road, Chandlers Ford, Southampton, Hants SO5 3AP.

BUSINESS NEWS

According to the latest figures from BREMA, CTV deliveries during the third quarter of 1988 were 1.3m compared to 1.1m in the previous year. Imports took 47 per cent of the market compared to 40 per cent, led by a surge in small-screen CTV deliveries from the Far East. VCR deliveries increased by nine per cent in the third quarter and by 22.6 per cent during the first three quarters of the year.

The European Commission has extended the scope of its investigation into charges of CTV dumping from South Korea, started in February 1988, to include China and Hong Kong. The three countries increased their exports of small-screen CTVs to the EC from 35,000 in 1985 (three per cent of the market) to 620,000 in 1987 (21.5 per cent of the market).

The South Korean manufacturer Daewoo is to set up an £18m VCR plant in Antrim, Northern Ireland with a production capacity of 500,000 machines a year.

Rumbelows has taken over the Surrey-based Ketts chain of 36 radio and TV stores. Polly Peck is taking over the Italian CTV manufacturer Imperial Electronics which was at one time part of Telefunken. Imperial has a capacity of 200,000 sets a year and for thirty years has produced sets for the own-brand market. Poly Peck's main CTV production is in Turkey.

Sony (UK) Ltd.'s manufacturing plant at Bridgend, South Wales has won the 1988 Quality Award. The award, made by the British Quality Association, is the premier UK award for quality achievement in British manufacturing and service industries.

S-VHS NEWS

Arrangements have been made to enable European Super-VHS equipment to be used with TV sets having a scart connector. There are three different methods. First, S-VHS equipment can be connected via the composite video signal input of a TV set's standard scart socket. Some sets however now have a second scart socket with pins 15 and 19 modified for Y/C signal input. This approach reduces cross-colour and dot interference. S-VHS VCRs and camcorders are switchable between composite video and Y/C outputs. It's also possible to split the S-VHS signal into its RGB components and feed these into an RGB compatible scart input: JVC is to release an S-VHS/RGB converter, Model KM-V7EG, for this purpose.

JVC is also releasing two high-resolution TV sets for use with the S-VHS format. Models AV-S250 and AV-S280 have 63 and 70cm screens respectively and feature wideband video processing circuitry which provides a horizontal resolution of 560 lines with the AV-S250 and 630 lines with the AV-S280. Both sets feature an S (Y/C) terminal, phono audio sockets and twin scart sockets, one

of which is modified for Y/C signal input. Other features include teletext, a 24-hour on/off timer, a two-way, four speaker system and surround sound circuitry.

Mitsubishi and Ferguson have introduced S-VHS VCRs. Ferguson's Model FV39S includes nicam 728 capability, VHS hi-fi stereo, long play and advanced indexing facilities. It's expected to sell at around £1,000 with a comprehensive package of accessories. Mitsubishi's HS-B70 has a similar specification and price, with automatic digital tracking, an LCD programmable remote control system and full on-screen operating and programming graphics.

Mitsubishi has also launched two large-screen TV sets equipped with nicam decoders and S connectors. The CT3703STX has an 89cm screen and dynamic beam focusing. The suggested price is £2,500 and the weight 92kg! The CT2553STX has a 59cm screen, an automatic switch-off timer and sells at a suggested £650. There are optional video cabinets for these two sets.

S-VHS tape for European use has been introduced by TDK: the XP (extra professional) tape has superfine particles and a coercivity of 900 Oersteds. A new calendaring process is used to improve the surface smoothness and a new binder and backcoating have been developed. TDK claims that a special additive improves head friction and durability. A permanent anti-static shell reduced dust contamination. The tape is available in two lengths, SE-120XP and SE-180XP at £10 and £11 respectively.

WIZARD DISTRIBUTORS

The Manchester-based component wholesaler Wizard Distributors of Empress Street Works, Empress Street, Manchester M16 9EN (061 872 5438) has produced its 1989 catalogue. Copies are available free of charge to trade customers. The new 84-page edition includes a section devoted to Hinari spares and a comprehensive video head identification list.

CABLE TV

The CATV franchises for Avon and Thames Estuary North and South, covering some 700,000 homes, have been awarded to United Cable, one of the largest US cable operators.

The Cable Authority is considering cancellation of the franchises awarded to some companies that have failed to start installing cable. Of the 27 franchises that have been awarded, covering some six million homes, well under half are in operation.

PANASONIC'S VIDEOPHONE

Panasonic intends to launch a videophone, Model WGR2, in the UK this summer at around £200. The unit has a camera and 4.5in. screen and can transmit and receive a monochrome still picture via the telephone line in about ten seconds. Transmission with a picture costs about the same as a standard phone call.

VIDEO NEWS

A digital VCR, Model VR6648, has been added to the Philips range. Digital features include picture-in-picture (PIP), multi-PIP, nine-picture tuner scan and strobe. The suggested price is £540.

We have been asked to correct the price of the Pentax 8mm camcorder Model PV-C840E mentioned in this

column in the October issue (page 902). The suggested price is £899.

IN BRIEF

Finlux has developed an experimental 12in. flat monochrome TV display screen using electroluminescence as the light source. . . Philips has introduced a programmable universal remote control unit, Model RC775, at £70. It has an LCD screen and can memorise up to 370 com-

mands applicable to up to ten appliances. . . Maplin has available a high-gain amplifier intended mainly for use when two TV sets or radios or a combination of these is used with a common aerial download. Model YP42V has a bandwidth of 40-860MHz, a typical gain of 15dB and is available at £17.95. Operation is from the mains. Other Maplin amplifier products include a battery-powered unit and units to drive up to three or four sets. . . Oracle has started its own soap opera called Park Avenue. It's updated at 1700 each day and occupies ten pages.

IBC '88

Geoff Lewis, B.A., M.Sc.

This was without doubt the largest and best-supported IBC to date, with large increases in the number of visitors to all aspects of the event. Even the typical IBC weather had an all time high: the tail end of hurricane Gilbert swept in soon after the opening, to provide some problems for the dish farm on the esplanade. It also ensured that visitors moved between the various venues in double quick time.

IBCs are intended to provide a forum for the exchange of the latest technological ideas and to make it possible to look at new practices and developments that affect the broadcast industry in general. This is done by the presentation of papers at the technical sessions and through the hardware displays in the exhibition. In one particular respect IBC '88 was again very thought provoking — the question of new TV standards was very much to the fore.

General View

From the advance list of papers it seemed that 1988 was to be the year of high-definition TV (HDTV). This was true, up to a point. If you step back a couple of years, you might then have supposed that by now the question of standards would have been settled. Not so! One began to wonder which of the 57 varieties was going to surface next. While Europeans have been trying to resolve the MAC-D/D2 problem, yet further MAC possibilities have been presented. Similarly in Japan variants on the NHK Muse system have been spawned, while reports from the USA confirmed that a lot of development work is going into HD-NTSC.

Slightly more than half the technical papers related to HDTV or satellite TV feeds to cable systems, and it might be pertinent to ask where this leaves terrestrial broadcasting systems? At present in the UK we have four channels of pretty good quality, and a fifth is on its way. Viewers have VCRs to enable programmes to be time-shifted and give access to a wide range of prerecorded material. The system is well understood. Will HDTV and satellite systems really give us a much wider viewing experience? And will they be economically viable?

It may be recalled that following the HDTV '87 colloquium in Ottawa last October there were to be public demonstrations of HDTV in its various forms, enabling comparisons to be made with high-quality NTSC images. Some 7,000 people took part in the survey, and the results are just becoming available. Whilst nearly everyone preferred HDTV, support fell when cost considerations were taken into account. Provided the extra cost of a top-of-

the-range receiver was about \$300-\$400, there was considerable support for a change to HDTV. But when a more realistic figure of \$1,500 per receiver was suggested interest waned considerably. It seems that there is considerable consumer demand provided the improvement in video and audio quality is accompanied by good quality programming and that the extra cost is reasonable.

IBC '88 brought out the rapid expansion in the application of digital techniques throughout broadcasting in general. Many systems are now computer or microprocessor controlled. Many electronic graphics and digital effects systems are based on the familiar IBM or look-alike personal computers. Digital effects machines are certainly becoming an important tool for the programme maker.

Satellite TV

The technical sessions provided information on developments for the Astra and BSB satellites, and some of the associated hardware was on display. The first Astra transmissions will use PAL, though MAC-D2 may well come into use as the number of channels increases. BSB is to use MAC-D from the start. It's a good job that dual-standard chip sets are likely to be available fairly soon to resolve at least one standards problem. BSB's diamond-shaped Squarial was to be seen, but few details of its performance were available. A gain of 12dBi was suggested. This compares reasonably well with the gain of 28dBi quoted for the BBC's steerable flat-plate aerial which has about ten times the surface area. If the Squarial has a beamwidth of 4-6° however, as is commonly expected, adjacent satellite interference could be a problem. Some brief details of the Eurocypher system to be used by BSB were made available. It uses the US G.I.-Videocypher system, which is fast becoming an industry standard, with an additional facility that allows the encrypting algorithm to be changed at will.

HDTV Systems

The Japanese NHK/Muse system was well presented in several displays. A production facility was shown in the Sports Hall of Sussex University, complete with a video effects and graphics machine. Further displays of the Electronic Cinema and Videoconferencing were available and were well patronised. From some of the comments overheard from the American contingent it seems that many in North America are glad that the Europeans didn't accept Muse as a world standard at the CCIR Dubrovnik meeting in May 1986. The delay has given them time for thought and consideration of the possibilities of their own evolutionary approach to HDTV, i.e. systems that are compatible with current NTSC broadcasting. Possibly as a result of this delay Muse-E and Muse-T now have three further relatives. There are Muse-6 and Muse-9 which require one and one and a half 6MHz

channels respectively, and Narrow-Muse. But the standards conversion is at present costly, as the 1,125/525 lines and 60/59.94 fields/second standards have no convenient ratios.

As reported after HDTV '87 in Ottawa, the search for an NTSC-compatible HDTV system continues. Of the five or six well-known centres that are carrying out research into this, probably the front-runner is the David Sarnoff Research Laboratories (ex-RCA) which has come up with two proposals, level-1 using a single 6MHz channel with enhanced definition and level-2 using two channels that provide NTSC-compatible HDTV.

The MAC family is not without a new offshoot, MAC-T, which has been proposed for electronic news gathering links. The video components would be processed in the standard MAC fashion, with conventional sync pulses and a colour burst instead of the digital sync bits. This has been devised to provide studio-quality images from portable equipment, to allow MAC-type scrambling and controlled access to be used, plus sound in syncs.

The EUREKA-95 MAC-HD display in a separately constructed seafront pavillion showed what has been achieved by European cooperation in just two years. The display covered the studio, transmission and the MAC-HD concept including MAC-D and MAC-D2. Receivers ranged from domestic sets with inputs via a Scart/Peritel Euroconnector to wide-screen equipment using either front or rear projection. The quality of the displayed images was of a very high standard. The comparison with PAL pictures produced comments to the effect that Alan Sugar should view the stand then donate a million pounds to the charity of his choice.

Fig. 1 shows the general arrangement of this display. The signal originating equipment, all to the MAC-HD standard, consisted of a studio plus two outside broadcast (OB) vehicles. The first OB vehicle was equipped with a camera and a VTR while the second one was equipped with suitable VTRs, audio recorders, monitors and mixer desks, acting as a control centre whose output was fed to a MAC-HD encoder. This output was further encoded into both MAC-D and MAC-D2 signals which were sent over various transmission links including a simulated satellite TV path, 10km of 140Mb/sec optical fibre and a microwave distribution link. The received signals were then decoded and displayed on suitable receivers — as previously outlined. In addition LaserVision video disc players and VCRs provided outputs of prerecorded material to complete the domestic scene.

Compatible HDTV images are produced in the studio, with 1,250 lines per frame. This is reduced to 625 lines for the MAC transmission, to provide an input for a standard MAC receiver. The line reduction is done in such a way that an HD receiver can reconstruct the missing lines

using a digital assistance signal encoded into the MAC data structure.

Microwave TV

A particularly interesting distribution system was shown in operation and described in a paper entitled "M³VDS — the cheapest, quickest and least obtrusive means of providing multichannel domestic TV?" M³ means millimetre-wave, multichannel, multipoint, the frequency band being 29GHz. While it was shown that such a system could easily support MAC-HD signals or up to thirty standard TV channels, the title must have been chosen with tongue in cheek. The GaAs semiconductor technology required to provide suitable receiver LNBs is about two years away, while the cost of the head-end transmitters is unknown and would certainly be greater than for the previously proposed 2.5GHz systems. So much for the "cheapest and quickest" bits. The 15cm diameter dish and LNB assembly was certainly unobtrusive, and might provide a range of 2-9km. There's still a strong case to be argued with the Department of Trade and Industry to try to get it off the fence and provide a frequency allocation for such services in the 2.5GHz band. At least we would then have the cost and availability benefits of the research that has already been done.

All-electronic Video Recorder

The most intriguing device to be described and displayed was without doubt a video recorder with no moving parts. This has been developed by Questech Ltd., using digital techniques with 512 dynamic random access memories (DRAMs) for storage. It's capable of recording 78 seconds of video with variable speed playback without loss of quality. Whilst this is very short by present standards the recorder is nevertheless useful for action replay of sporting events. A unique feature is that the device has several output ports that allow a single frame and the events that led up to it to be displayed simultaneously. By 1989/90 it's anticipated that 4Mbit DRAMs will be available, enabling the recording time to be extended to more than five minutes. This would make the recorder a valuable tool for the producer of commercials, etc.

In Conclusion

From conversations with engineers on the stands of the UK broadcasting organisations I detected a degree of caution and concern regarding the future of British TV. Such is the impact of the government's ideas about deregulation of the industry. The effects that the proposals contained in the government's White Paper might have on research and development in the UK, which has always been in the forefront of advances in broadcasting, were being pondered. An interesting comment from one old-hand suggested that governments periodically dig at the roots of broadcasting just to see if they are still alive. This is acceptable — provided the roots aren't disturbed so much that the plant is killed off.

The next meeting of the CCIR, to discuss the question of a single world standard for HDTV, is scheduled for 1990. I wonder what the odds are that there will be a proposal to adopt three standards, Muse, MAC-HD and HD-NTSC, with a further proposal to meet again to decide on a single conversion standard in 1992 or subsequently?

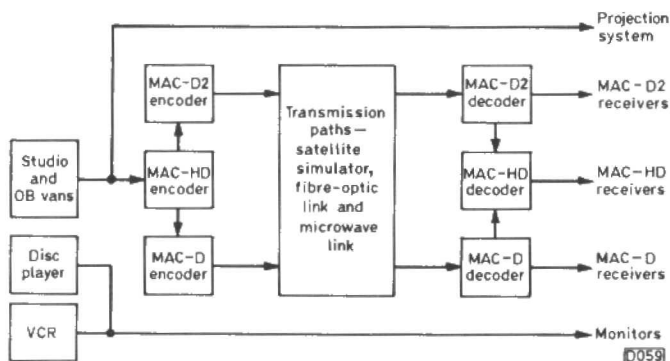


Fig. 1: The EUREKA-95 display at IBC '88.

Practical Guide to Satellite TV

Roger Bunney

In the March-May 1988 issues I described a simple, low-cost satellite TVRO system. The aim was to achieve efficient reception at minimal cost, and to that end a dish with patio mount was used. When I bought that package of equipment I knew very little about satellite TV reception. Since then I've learnt a lot, in particular from hands-on experience of playing with and modifying the system. This has enabled me to assess the merits and shortcomings of basic equipment.

With the ever increasing interest in satellite TV reception a wide range of equipment has become available at reasonable prices. My first package, which included everything, cost just £302 plus VAT. This included a 90cm dish with patio mount for reception from a single satellite.

Dishes

The dishes available on the domestic UK market fall into two categories, prime-focus and offset types. As the name suggests, the prime-focus type focuses the incoming signal at a point in front of the dish. This is where you mount the feed assembly and head electronics, normally by means of three or four support arms that provide rigidity and accurate alignment. The offset type of dish focuses the incoming signal at a point to one side of the dish. It's somewhat more efficient since the feed assembly, the head electronics and their supports don't obscure the incoming signal. Prime-focus dishes are usually spun or pressed to shape and are available in standard sizes ranging from 60cm to 3m. The usual sizes used in domestic installations for reception of low-power satellites, i.e. not Astra, are 90cm and 1.2m, though the sizes continue upwards through 1.5m, 1.8m, 2m, 2.5m and 3m. A 60cm dish is suitable for Astra's signals. Clearly the larger sizes will tend to dominate the location, hence the popularity of 90cm and 1.2m dishes. Provided you don't live in a conservation area a 90cm dish can be installed in a garden or on a house without the need for planning permission. The larger sizes require such permission in theory, but if the dish is in a very large garden and is not visible from outside your boundary who's to know? Offset dishes are usually formed in fibre-glass.

Mounts

The dish requires support. It can be fixed to a patio mount aligned for reception from a single satellite or attached to a tracking mount that gives reception from

several satellites. The patio system supports the dish rim via a rear prop arm that's adjustable for elevation. At its lower end the rear prop arm is welded to a steel hoop which is normally bolted down to the patio, flat roof or whatever. Once the system has been aligned for reception from the desired satellite the hoop is fixed (azimuth alignment) and the elevation adjustment is bolted.

The satellites that transmit TV are in geosynchronous orbit above the equator, i.e. they are stationary relative to any point on the Earth's surface. To view these satellites in the UK we need to look to the south east/south/south west. If the dish is supported by a polar mount it will, once correctly set up, provide correct tracking of the equatorial arc. This is the recommended system.

Polar Mount Alignment

Unless you have experience, setting up a polar mount can be difficult. It's a task that must be done carefully. Normally the dish/mount supplier will provide alignment details. Two adjustments are required in the vertical plane. Elevation has already been mentioned. In addition, declination offset has to be taken into account. This is usually measured between the back of the dish (on a flat spot) and a section of the mount such as the axis bar. In the southern UK the declination angle is 7.3° . The declination adjustment lowers the dish sight on to the satellite arc. Elevation is adjusted to the site latitude.

Thus the polar axis angle (local latitude) is first set, followed by the declination offset. Appropriate screw/bolt adjustments are provided at the rear of the dish. The dish assembly on its stand is then aligned on a north/south line, so that the axis of the polar mount is correct. For this adjustment, refer to a flat plane on the dish and use this for sighting. Once as nearly correct as possible N/S alignment has been achieved an additional offset angle is added. This is for magnetic declination and adds a further 7° adjustment to the west. Most dish stands have appropriate locking bolts and swivel action for this. All this sounds rather complicated!

Preferred Method

My own method is to set the declination offset (polar axis) using a made-up aluminium angle. The dish is then set on an approximate N/S line and the magnetic offset is added. The Intelsat bird at 1°W is used as a signal source. After setting the dish to the approximately correct angle for 1°W the signals will soon be found. The dish is then swung between 27°W and 13°E where other satellites provide signals. With these three satellites used to provide reference signals I find that only azimuth correction is required. This is done simply via the swivel system, which locks to the stand base and is usually a large bolt. By checking the alignment at 27°W and 13°E — gently pushing or pulling the lower rim of the dish and noting the rise/fall of the signals, making adjustment as necessary — you can gradually set the tracking arc of the dish mounting so that it coincides with the equatorial arc, thus obtaining optimum signals. This is simpler than it sounds, though

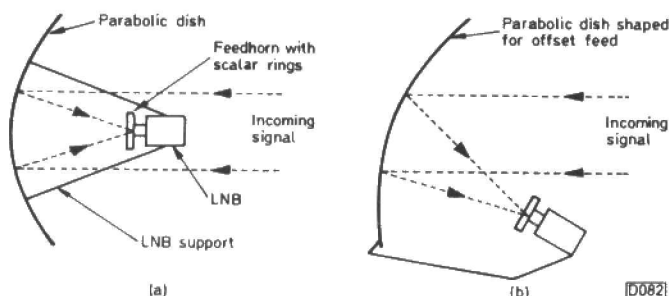


Fig. 1: Prime-focus (a) and offset (b) dishes.

effort is needed. Once you've got the tracking right efficient reception will be attained.

Head End

The feed tube/horn which is connected to the LNB (low-noise block down-converter) is fitted at the focal point of the dish. The tube conveys the signal at the focal point to the LNB's pickup probe. It's often fitted with a scalar ring assembly which is used for fine tuning, maximising pickup of the wanted signal while minimising pickup of unwanted signals/noise from the sides. The ring assembly peaks quite positively, giving a further 0.5dB or so of gain.

The signals in the 10.9-11.7GHz band used by the low-power satellites and the medium-power Astra satellite are plane polarised, i.e. they are either vertically or horizontally polarised. To change from reception of a vertically polarised to a horizontally polarised signal the LNB can be rotated through 90°, thus rotating the pickup probe, or a polarotor can be fitted. The standard polarotor has a movable metal pickup probe within a waveguide feed tube, driven by a small motor. This is an effective way of changing the reception polarisation but introduces an insertion loss of around 2-3dB. A more recent device is the ferrite-based polarotor, e.g. the IRTE Paris. This has no moving parts and contributes an insertion loss of just 0.2-0.3dB. It costs about twice as much as a traditional mechanical polarotor however. The polarotor fits between the feed tube and the LNB.

LNBs are available at a wide variety of prices depending mainly on the noise figure. Thus an LNB with a noise figure of 2dB, typically with a gallium arsenide f.e.t. front end, costs in the region of £65 trade while an LNB with a noise figure of 1.3dB, using hemt devices, will cost perhaps £140 trade. Very recently an LNB with a noise figure of 0.6dB has been introduced — the catalogue says price on application! The gain provided by a domestic type Ku-band LNB is around 50-60dB.

Apart from remote switching for vertical or horizontal polarisation there are generally no controls for the head electronics either outdoors or indoors. Associated with the polarisation switching there may be an indoor skew control to give variable control.

Feeder

The LNB provides a wideband output of 950-1,750MHz via either a standard US domestic F connector socket or a

professional N socket — the F connector is more usual. It's possible to connect low-loss coaxial cable such as RF125 to an F connector by carefully soldering the screen braid to the outside ring of an F plug with the inner conductor serving as the connection to the LNB's signal path. RF125 has the same loss figure as UR67 but is somewhat cheaper — and is vastly cheaper than most of the "correct" coaxial cable sold for this purpose. Since my own cable run is only 60ft the loss can be tolerated — inexpensive line amplifiers with a gain of typically 10dB are available to overcome losses and maintain optimum noise performance.

Receivers

The receiver/tuner market is vast. You can pay several hundred pounds for the best all-singing, all-dancing remote-control receivers. I'm still using a basic knob and switches receiver: the tuning is by means of a large knob calibrated 1-24! I've added variable bandwidth switching via an outboard unit connected to an i.f. loop with access at the rear of the receiver.

In Conclusion

The dish I now use tracks accurately using the cheapest Drake controller and actuator arm. It was collected from a nearby company (Metspin) where you can actually see the things being made. Perhaps I was fortunate: Metspin has manufactured dishes for Marconi and for military use for some years and the domestic market represents a natural spinoff — many of the tight government specifications are retained (there are not many domestic spun dishes that have a minimum 2mm thickness).

In closing this short guide to practical satellite TV reception I'd like to mention several companies that have provided help. North East Satellite Systems provided a great deal of help but now supply only professional users. Micro-X has a vast range of equipment and supplies have been very prompt. Alston-Barry provided the Drake equipment: they were similarly prompt in supplying equipment and in sorting out a small problem. I would recommend the *Echosphere Dealer Handbook* which covers the theory and provides practical guidance on installation, with lots of illustrations. I got my copy from North East Satellite Systems: it's expensive but perhaps the best. For what's in the sky the *World Satellite Almanac 1988* is excellent but costs £30.

One thing I've not mentioned so far is flat aerials. Although much work is being done in this field most of those shown so far have been dummies. The main problem appears to be that of achieving quantity production at a competitive price.

Addresses

Addresses of the firms mentioned in this article are as follows:

Alston-Barry International, Units 4/5, Winborn Building, Convent Drive, Waterbeach, Cambridge CB5 9PB (trade only).

Metspin Ltd., 94b New Brighton Road, Emsworth, Hants PO10 7QS.

Micro-X, Unit 2, Drury Way Industrial Estate, Lacton Close, Neasden, London NW10 0TG (trade only).

North East Satellite Systems, Cropton, Pickering, North Yorkshire YO18 8HL.

Table 1: Typical dish gain at 12GHz

Diameter	60 per cent efficiency	70 per cent efficiency	80 per cent efficiency
0.5m	33.75dB	34.41dB	34.99dB
1m	39.77dB	40.40dB	41.02dB
1.5m	42.91dB	43.29dB	44.54dB
2m	45.79dB	46.46dB	47.04dB

Prime-focus dishes of good quality have efficiencies up to 70 per cent. The efficiency of offset parabolic dishes can exceed 80 per cent.

Beamwidths (at the -3dB points) of prime-focus dishes at 12GHz are: 0.5m 3.43°; 1m 1.72°; 1.5m 1.14°; 2m 0.86°.

We are indebted to the Echosphere Corporation for the above information.

Servicing the Ferguson TX10 Chassis

K. Rutherford

The Ferguson TX10 was the first large-screen chassis in the TX series. Some radical ideas were incorporated in its design, mainly in deriving the e.h.t. from the chopper transformer but also in the design of the chopper circuit itself. Mounting the RGB output stages on the c.r.t. base panel is nowadays commonplace, but the TX10 was amongst the first to have them there.

Helped by its 65W power consumption, which keeps the temperature inside the cabinet at a very reasonable level, the TX10 is an inherently reliable chassis. The picture quality is such that the chassis has been approved for monitor use in broadcasting studios, though not for quality assessment – it has found use as a monitor by outside broadcast commentators, and was to be seen in numbers serving guests at the wedding of The Prince and Princess of Wales. Its reasonable pedigree would suggest long and dedicated service, which is certainly true of this chassis. Commonly-found faults are very few: more often the faults encountered tend to be obscure and baffling. After power supply faults, remote-control system troubles are the next most common ones.

The Power Supply

The TX10 has a synchronous chopper power supply that converts the 360V from the mains bridge rectifier to e.h.t. at 25kV (the focus voltage is derived from this), 205V for the RGB output stages, 26V for the field timebase chip, 22V for the audio output stage(s) and an input to the 12V regulator which supplies the low-power stages of the receiver, the supply for the c.r.t.'s heaters, and the 150V supply for the line output stage. The latter is the one that's monitored by the TDA2582 chopper control chip.

In the Mk III version of the chassis, which has the PC1560 main panel with plastic mounting frame as distinct from the earlier versions with a metal frame, R813 is a troublesome component. It forms part of the potential divider that monitors the 150V line, supplying an error voltage to pin 8 of the TDA2582 chip. In every case of field roll and intermittent tripping, check the 150V rail. If the voltage is high, suspect R813. It's a critical component which should be replaced with the recommended type from Ferguson or one of the official stockists. A convenient pin at which to monitor the 150V rail is on the signals panel, between the tuner and the large plug at the left-hand end of the board. A reading of 75V at the 150V test pin generally indicates that R813 has gone open-circuit or at least very high in value.

I find an analogue meter to be best for measuring voltages in TV receivers because it's relatively unaffected by the large quantities of line-frequency garbage sometimes present. One digital meter I tried was accurate to the nth degree but gave a reading that varied considerably depending on the proximity of the meter to the chassis. This applied not just with the TX10 but also with other manufacturer's models. You can't beat the good old industry standard Avo 8, but whatever you use should have a sensitivity of 20k Ω /V or better.

Power supply tripping is fairly common with the TX10. It can be produced by a number of causes. The trip inputs

sense excessive chopper transistor current, excessive beam current and excessive back-e.m.f. voltage. If the receiver trips at switch-on the cause is almost certainly excess chopper transistor current. Check the various supply rails for a short-circuit, using the ohms range of your meter. If the trip occurs after a very brief delay you can add excessive flyback voltage to the list of possibilities.

Reduce the setting of the "set-h.t." potentiometer RV801 in an attempt to stop the tripping. If the receiver operates but the 150V rail is low, check the capacitors in the chopper transistor's emitter circuit – C711 and C712. Should the tripping occur after the c.r.t. has warmed up, obvious things to check are the c.r.t. supplies and the beam limiting system. In my experience however the main cause of tripping is the focus control assembly. An improved type is used in later models. This is distinguishable by its tall thin shape in contrast with the somewhat squat, rectangular shape of the earlier type. The new control requires adaptation to fit the chassis – a kit is normally supplied with the replacement unit.

Other causes of tripping can include a faulty insulator on the line output transistor TR831, i.e. a puncture caused by a flashover or minute particles of metal or even grit. The connection to the c.r.t. Aquadag is also important. Check it right through to the chassis. Short-circuit turns in the line output transformer can result in tripping. Older models can exhibit a tendency to trip randomly, particularly after fitting a replacement c.r.t. In this event check whether R706 is fitted (between the junction of T703/D727/D733 and chassis) and its value – it needs to be 22k Ω .

Failure of the earlier focus control was the result of its insulation breaking down, allowing the focus voltage to flash over to the chassis metalwork – or your hand when you attempt to adjust it! Focus control arcing can also cause spurious channel changing etc., see later.

If the power supply doesn't come on, check that 22V is present at the cathodes of D721 and D722, check for 11.5V at the emitter of the 12V regulator transistor TR801 and for 6.2V at the cathode of zener diode D801. If pin 5 of IC801 is at 5.5V the receiver has fast tripped and something is seriously wrong in the set, e.g. the line output transistor is short-circuit or one of the rectifier diodes connected to the secondary windings on the chopper transformer is dud. Take care when attempting to measure IC801's pin voltages – a mere slip of the probe can cause a lot of extra work! Pins 6 and 8 are particularly sensitive. The power supply will trip when a meter probe touches pin 6. When pin 8 is touched with the probe the set may not trip but hand capacitance to the meter probe introduces hum into the power supply. Hum is deliberately introduced via R819 (2.2M Ω) to cancel ripple on the 360V rectified mains supply. A faulty 12V regulator circuit (TR801, D802) can be the cause of the set switching off after a few seconds.

An oscilloscope is a great help when fault-finding in this area, but when looking at the drive waveform at the base of TR701 remember that you are on the live side of the mains isolation barrier, so the earth lead must not be connected to the isolated side of the chassis. Make sure that your scope is not earthed, and if you have to delve

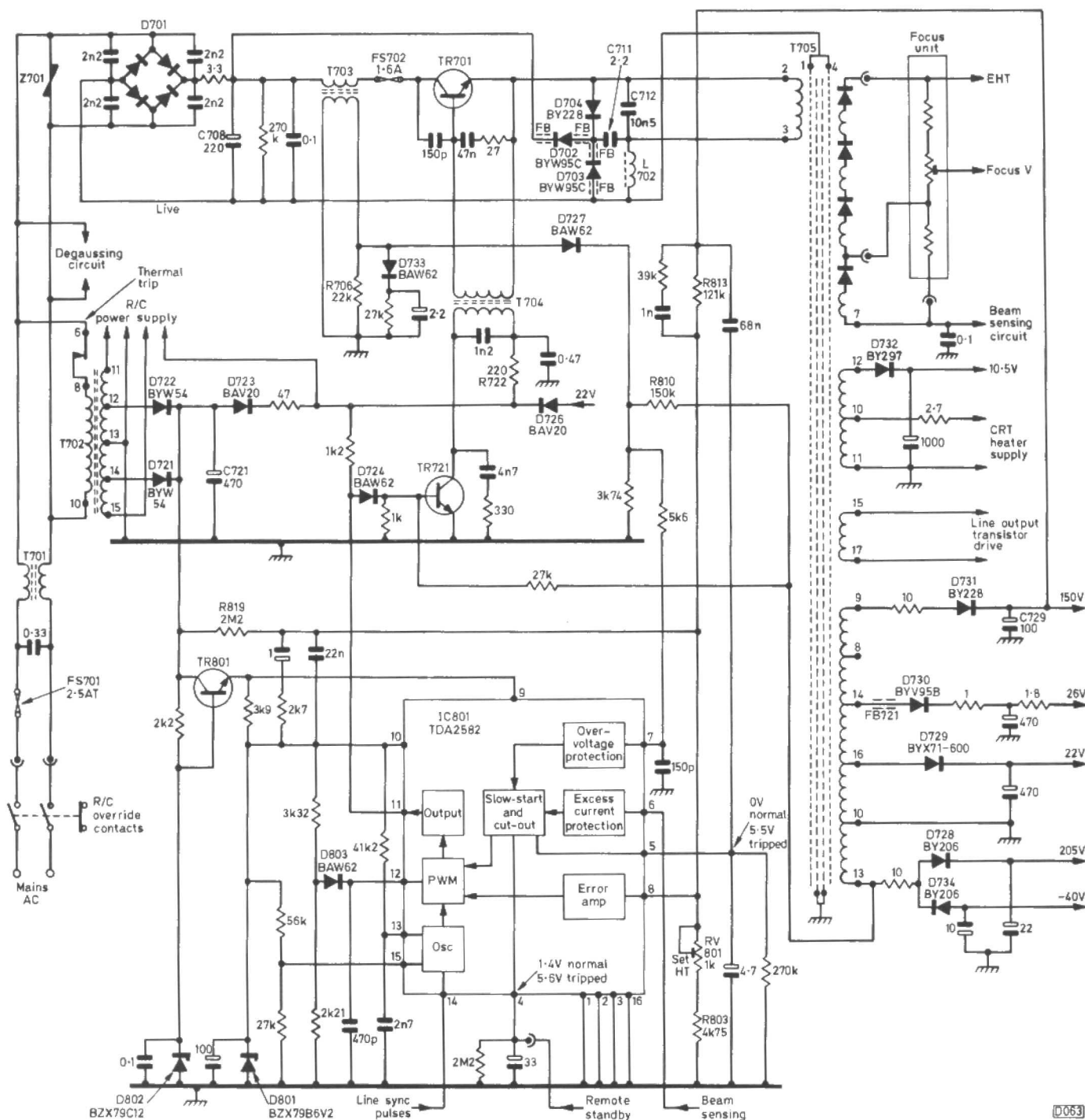


Fig. 1: The chopper power supply circuit used in the Ferguson TX10 chassis. The chopper transistor TR701 is type BU208B or S518T with panels PC1500 and PC1550 (due to shortages other types were used) and type BU508A with panel PC1560. On all panels the driver transistor TR721 is type BC639 and the 12V regulator transistor TR801 is type BC547. Surplus energy in the chopper's output circuit is returned to the mains bridge rectifier's reservoir capacitor C708 via D702, increasing the circuit efficiency. T703 senses the chopper current. The e.h.t. is monitored at the anode of D728, via R810. Beam current is monitored at the earthy end of the chopper transformer's diode split winding. D701 type SKB208/L5A or 4 × BY133GP.

into the non-isolated part of the chassis use an isolating transformer. Isolated chassis are all very well, but they can give you a false sense of security – constant care must be exercised. If your workshop's bench mains supply is not isolated, get it done!

The line-frequency output from IC801 to the chopper driver transistor TR721 is at pin 11. If a trip condition has removed the drive from IC801 pin 11 will go low, holding TR721 cut off. If pin 11 is high and the driver transistor is on, with R722 getting hot, IC801 has passed away.

Typical d.c. resistance readings for the four main supply rails derived from the chopper transformer, taken with the

Avo meter's negative (red) lead connected to chassis, are as follows: 205V rail 30kΩ, 150V rail 30kΩ, 26V rail 4.5kΩ, 22V rail 17kΩ.

The most frequent problem on the primary side of the chopper transformer is instant destruction of the chopper transistor TR701. D704 can be the cause of this, as can C711 being open-circuit or C712 being dry-jointed. On the subject of dry-joints, it's wise to resolder the pins of the chopper transformer T705 whenever a TX10 enters the workshop – it could save you a callback. Don't forget that one of the pins is hidden beneath the chassis brace. Dry-joints on the primary winding pins 2 and 3 can cause

intermittent failure of TR701. Dry-joints on the heater supply pins can give intermittent loss of picture. Tripping and intermittent spurious control action, such as switching to standby, are other effects produced by dry-joints around T705. Arcs around ferrite bead FB721 can cause very intermittent field roll and tripping on/off – resolder it clear of the PCB.

Before leaving the power supply, problems with the thermistor in the degaussing circuit can cause fuse blowing and impurity. This occurs with the round, white thermistor. Use the black type with rounded-off corners.

Line Deflection

The line output transistor TR831 is a BU208B. Protection diode D831 in its base circuit has given trouble. It has also been indirectly responsible for a loud line whistle – to stop this, glue the ferrite beads on its leads firmly in place. In the PC1560 series version the line output transistor is TR821, type BU508A, while its protection diode is D743 – this can also produce the line whistle problem, so have a go with glue here as well.

Apart from the line output transistor and its protection diode the only troublesome component in the line output stage is the transformer T721. Symptoms of its failure include tripping, a non-linear scan, line tearing and screeching from the scan coils, and instant destruction of TR831. Sometimes T721 burns out because D831 has gone leaky – check it by substitution. When D831 goes open-circuit severe line ringing will be noticed, the picture width will decrease and eventually the receiver will go into the trip mode. Don't run the set for longer than necessary in the condition before the trip operates as this will damage TR831. The remainder of the circuit, including the first anode supply and the EW raster correction system, has proved to be reliable. Sometimes the width control RV851 changes value to give reduced width.

Field Deflection

Troubles in the field deflection circuit have been few. In the earlier sets with PC1500 and PC1550 main panels a TDA1044 field timebase chip is used in conjunction with a two-transistor output stage. In cases of insufficient height and slow flyback, take a look at C781 (100 μ F) and TR771 (ZTX450K). Various stages in the decline of C781 will result in varying degrees of field foldover. With the PC1560 series panel a TDA3652 chip is used as field driver and output stage.

The Sync Processor Chip

Three different types of sync processor/line timebase generator chip have been used, the TDA2576 (IC791) in earlier versions of the PC1500 panel, the TDA2576A (IC741) in later versions of the PC1500 panel and the PC1550 panel, and the TDA2578A (IC742) in the PC1560 panel. The TDA2576A has an improved sandcastle pulse generator plus 50/60Hz switching while the TDA2578A also incorporates the field generator. Occasionally a later type signals panel may be paired with a main panel that has a TDA2576 chip. This will give rise to flickering colour due to the value of R627, which should be 15k Ω with the TDA2576A and TDA2578A and 820 Ω with the TDA2576.

Some problems arose with the TDA2578A chip. To overcome line tearing with some VCRs, R756 was changed to 6.8k Ω . For bent verticals at high contrast

settings, add an underboard link between the earthy ends of C742 and C745. If line lock is disrupted at switch on, especially in cold weather, exchange C742 (220 μ F) and C745 (100- μ F).

Tuner and IF Strip

To improve reliability many engineers replaced the Ferguson SC4 tuner with an ELC1043/05. Now that the latter is no longer available the situation has been reversed. It's obvious that the SC4 has been modified – far fewer fail than was the case a year or two ago. The r.f. amplifier stage appears to be the most vulnerable stage, and thunderstorms can wreak havoc. The tuner is followed by an eight-pin Plessey SL1430 or SL1432 i.f. preamplifier chip, IC50. This can be responsible for a peculiar fault: the signal fades into severe noise patterning. Where an SL1430 is used this must be replaced. If an SL1432 is fitted, try connecting a 220k Ω resistor from pin 1 to chassis before condemning the chip. Note that these two chips are not interchangeable.

The rest of the i.f. strip is centred around a TDA2540 chip, IC51. This is highly reliable, though lightning damage can include this device. Less reliable is the 12V regulator chip IC621. Lack-lustre performance, shifting grey scale and weak sound are the symptoms during this device's dying throes. The replacement should be well supplied with heatsink compound. As previously mentioned, picture fade out can be caused by a dry-joint on the chopper transformer's c.r.t. heater supply pins. We've had fade out followed after a few seconds by fade in.

Checks by Muting

A trouble-shooting tip relating to the TDA3560 colour decoder chip IC601 requires the use of a small 1.5V torch cell. If you suspect that the cause of a picture disturbance is in the pre-RGB output stage areas, the internal RGB switches in IC601 can be operated by applying 1.5V at pin 5 of plug 18 on the rear edge of the signals panel. If the resultant blank raster is undisturbed (wind up the brightness a little) it's likely that the RGB output stages are o.k. This method does not kill the sync input to the sync processor chip, so the timebases remain synchronised. It can also be used to mute the sound i.f. (but not to disable the demodulator, the volume control or the audio output stage(s)) by applying 1.5V to point C (point W with the PC1551 and PC1561 signals panels) and also to mute the vision i.f. by applying 1.5V to point K. The ability to isolate trouble by using this simple switching technique can be a real time-saver.

RGB Output Stages

The major source of trouble on the c.r.t. base panel has always been the tendency of the BF460 RGB output transistors TR654/5/6 to go short-circuit base-to-emitter. The effect of this on the receiver's performance is not immediately apparent, though it does cause a very slight shift in the grey-scale, the direction depending on which of the transistors has failed. It also causes vision buzz on sound by putting video on the 12V line. The long term effect however is that the RGB output stages' green LED biasing diode D657 will be slowly destroyed. This results in a rise in the voltage across D657, with a corresponding decrease in brightness until the tube is eventually cut off. Replacing D657 will restore the vision but not cure the fault. Measuring the current flowing through D657 will

produce a reading of 90mA instead of the correct 25-30mA. Finding which transistor of the three is faulty is a simple ohmmeter job. The normal voltage across D657 is 2.1V.

Failure of one of the driver transistors TR651/2/3 will flood the relevant gun, i.e. failure of TR651 will produce a blue flood etc.

Sound Problems

Sound problems with the TX10 are very few. L531 (later L561) occasionally requires a tweak to stop slight intercarrier buzz and you get the odd rattling loudspeaker, but generally the audio section is trouble free.

Remote Control

Problems with the remote control system, where fitted, can produce the occasional complaint that the normalised volume setting steadily rises. The answer to this is to change D101 to a silicon type – Ferguson's widely used PH425 is ideal. Spurious remote-control system operation is another problem that's given the writer more than a few headaches over the years. Sudden unwanted changes of volume, contrast, saturation, brightness or channel, or equally mysterious dropping into the standby mode, are symptoms of impulsive interference getting into the remote control processing circuitry and being interpreted as commands. Internal sparking in the receiver can do this – due to a defective focus unit for example, or imperfect Aquadag contact – but the interference can also come from the mains. Ferguson's answer to this is to add a link beneath board PC1515 from pin 12 of IC101 (SAA5012) to the earthy end of C106. This diminishes the amount of transient pickup in the earth tracks and prevents interference clocking itself into the SAA5012.

In receivers that use the PC1548 remote control receiver board striations can occur due to inadequate decoupling – change C915 to 10µF. The SAA5012's clock oscillator on panel PC1536 can sometimes fail to start – it often does so when the set has aged. The result is loss of text. Changing R1131 to 47kΩ will restore the vital signals. Another peculiar fault in some sets equipped with teletext is loss of sync due to poor contact at pin 3 of SK19A, as a result of which the looped through sync signal on the text panel is lost.

Tuning Drift

Finally, tuning drift with eight-channel remote-control TX10s can sometimes be baffling, all channels but one showing the fault. The cause of this is a leaky diode that couples the voltage from the slider of a tuning potentiometer to the tuning line. It doesn't matter when the leaky diode is the one in use, but when another channel is selected the diode will affect the turning voltage, causing random drift as its reverse leakage current varies.

The Tube

There must be many TX10s that have been put aside due to failing tubes and/or obscure faults. The 30AX tubes used in this chassis are expensive to replace but give an impressive performance when new, especially with teletext. Retubing a TX10 is a good proposition when the replacement tube is not too expensive and performs to the original standard – sadly very few of them do.

next month in

TELEVISION

Extra Next Month – the HRS Astra Satellite TV Guide

Details of the Astra transmissions and equipment for reception.

(Inclusion of this guide depends on the successful launch of Astra).

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At the Japan Electronics Show

George Cole

Japanese consumers were faced with a plethora of television sets and broadcast systems, not to mention other domestic electronics equipment, at this year's Electronics Show, held at Tokyo's Harumi fairground.

HDTV

Many companies, including JVC, Sony, Hitachi, Panasonic, Mitsubishi, Sharp, Toshiba and NEC, held demonstrations of the Japanese 1,125-line/60-field HDTV system, now commonly referred to as Muse (multiple subnyquist encoding) after the technique used for bandwidth compression. Although Europe and America seem to have abandoned the idea of adopting Muse, the system is being heavily promoted in Japan where it's being sold under the banner "Hi-Vision", which certainly sounds more consumer-friendly!

I managed to take a look at the HDTV demonstrations provided by all the above companies and also one put on by the EIJA (Electronic Industries Association of Japan). My general impression is that Muse is very good under certain conditions but under others its defects are all too apparent. The first Muse demonstrations some time back used 30in. c.r.t.s: the pictures were sharp, detailed and clear, with the improvement over NTSC (and indeed PAL) clearly visible. This time companies also held "AV theatres" where Muse was shown on 120in. screens using back-projection systems. These were held in the dark, presumably to emulate a cinema atmosphere. The problem was that one couldn't avoid the comparison between Muse and 35mm film.

One of the biggest surprises was the huge variation in picture quality. Some companies, notably Sony, JVC and Sanyo, produced fairly impressive large-screen demonstrations. NEC's pictures were marred by noise, low contrast and poor colour however.

The large-screen demonstrations tended to suffer from three faults. First there was an increase in grain, which was clearly visible from a distance. Secondly colour shimmering was evident. With some material this was very distracting. The third problem occurred whenever a camera panned across a scene. In the Hitachi demonstration for example the camera followed a woman as she walked across a room. As the camera moved the woman went out of focus, and when she stopped there was a slight pause before the camera locked in focus. I managed to talk to several Japanese TV engineers about this focusing problem. They readily acknowledged that it was a Muse defect. Apparently the problem is worse with cameras that have a pickup tube, since tubes are more prone to image lag: the new-style CCD Muse cameras (see below) claim to improve if not cure this condition.

Japanese electronics and broadcasting companies are gearing up for Muse and have embarked on a number of Hi-Vision/Muse promotional activities, including a Hi-Vision week that started on November 25th (11/25, get it?!) The first full-scale Muse broadcasts from the BS3 DBS satellite are planned for 1990.

There is still some work to be done to develop l.s.i. chips for Muse signal processing. The current Muse decoders are larger than the 30in. receivers and, while wandering around the back of one Muse demonstration, I

came across a mass of electronics watched over by an army of technicians!

Most of the Muse pictures were sourced from one-inch VTRs, though there is now a standard for half-inch Muse VCRs. These recorders use helical scanning and employ newly developed video heads. The cassette dimensions are 205 × 121 × 25mm (slightly larger than for VHS), the tape being of the metal particle type. Playing time is an hour. The recording system uses analogue base-band f.m. for the video signal, with a luminance bandwidth of 20MHz and a chrominance bandwidth of 7MHz. The audio is PCM digital, with a 48kHz sampling frequency and 16-bit quantisation. Up to four audio channels can be recorded.

Sanyo displayed a Muse video disc player which plays 30cm discs made from plastics or glass. It measured 440 × 515 × 182mm and weighed 22kg. The disc's CLV playing time is an hour per side. Sanyo also showed a Muse/NTSC decoder which can be used to convert Muse into a standard NTSC signal. It was a massive 480 × 600 × 384mm, weighing 66kg! After much miniaturisation Sanyo expect to have such decoders for sale at around £45.

Companies are working on Muse still picture systems. JVC has developed one that stores HDTV pictures digitally on an AHD (audio high density) disc. Fuji uses a WORM (write once read many times) optical disc to hold 500 fields of Muse video images. Sanyo displayed its HDV1100 videograph at the show.

One of the problems with Muse cameras is their insensitivity at low light levels. NHK (the Japanese Broadcasting Corporation) has however developed a HARP $\frac{2}{3}$ in. CCD imager that improves the sensitivity by a factor of ten. HARP? — high-gain, avalanche-rushing, amorphous photoconductor!

EDTV and IDTV

Regular Muse transmissions may still be a couple of years away, but Japanese consumers can already buy TV sets that improve the quality of standard NTSC. These are for use with EDTV (extended definition TV), a broadcast system in which a high-frequency signal is multiplexed on to the standard luminance signal to give improved resolution. The chrominance bandwidth is also extended with EDTV. Unlike Muse, EDTV (called "Clear Vision") is compatible with standard NTSC equipment. Another system is the receiver-based IDTV (improved definition TV).

Both systems employ 3D filtering and sequential scanning to improve the vertical resolution and reduce cross-colour and dot interference, but I can't say that I was overly impressed with what I saw. The pictures looked cleaner, and there was a slight improvement in definition, but neither system was a great advance on standard NTSC.

LCD Screens

At the other end of the market there were numerous pocket-sized TV sets using LCD screens. Many companies had two- and three-inch models. Toshiba showed four and 6.5in. screens. The smaller screens looked sharper.

Sharp showed its 14in. LCD panel (see Teletopics, October 1988) which pushes current LCD screen technology to the limit — and shows it.

Some companies, such as Sharp and Toshiba, have turned the concept of large, flat LCD screens on its head and produced LCD projectors. Sharp's 100in. LCD projection TV uses three 3in. LCD RGB panels as the picture source, four dichroic mirrors, three condenser lenses plus a mirror and a projection lens. The LCD panels are insulated against heat and light. They use cyclohexane high-purity liquid-crystal material and amorphous silicon thin-film transistors.

Portable AV Equipment

LCD screens are also being used in portable video equipment, including Sony's GV-8 "Videowalkman" (see Teletopics August and October 1988). The Walkman has a smaller head drum than the standard 8mm type, 20mm instead of 40mm, with an extended tape wrap and faster drum speed (3,000 r.p.m. for PAL). Sony's Betamovie system with miniature drum used a single head with time compression to increase the scanning rate: the cost was loss of in-camera playback. The Walkman has two heads placed on the same side of the drum and dispenses with fast scanning to allow normal playback. Sony is also pushing 8mm software — over 400 titles are available in Japan. For Europe, Sony has reached licensing deals with Warner, CBS-Fox and CIC.

Casio showed a portable VHS "TVCR", Model VF3000, which has an LCD screen, a TV tuner and plays full-size VHS tapes. It sells for the equivalent of about £560 and weighs 2kg.

Panasonic's NV-1 Videowalkman uses Super VHS-C cassettes and has nine heads, a 3in. colour LCD TV, hi-fi sound, twin speeds, a TV/radio tuner and speaker. It sells for the equivalent of about £840 and weighs 1.5kg. The NV-1 is a very impressive machine, hampered only by its short playing time of just one hour in the LP mode. JVC and Matsushita are working on thinner S-VHS-C and VHS-C tape to increase the playing time to two hours in the LP mode.

S-VHS

Second generation S-VHS machines were in evidence. JVC's HR-S10000, selling at the equivalent of around £1,340, features a number of improvements to the S-VHS system. These include a new Y/C processor chip, a colour response improvement circuit to reduce colour edging, a twin skew corrector circuit with separate wideband CCDs for the luminance and chrominance signals, a dynamic colour level control circuit, a new noise-reduction circuit, a linear phase aperture correction chip, a new tape guide-roller, a tape stabilising head drum, impedance rollers for smoother tape running and a newly-developed tape guide roller supported by a ball bearing for the supply reel. Hi-fi sound quality has been improved by a new head switching noise-reduction circuit, gold-plated connectors, a PCB exclusively for audio processing and new audio capacitors. The HR-S10000 also includes a new editing feature called VOS — video-on-sound recording. This allows hi-fi VCRs to record linear and hi-fi sound tracks independently of the video signal, which can be dubbed on top after the sound tracks have been recorded.

JVC also demonstrated a VHS editing deck, the RV-1000, which includes insert edit, assembly edit, audio dub and VOS for the equivalent of about £180.



The Panasonic NV-1 Videowalkman, with headband camera.

Panasonic's NV-M50 at around £930 is an S-VHS-C camcorder with hi-fi sound, nine heads, the VISS index system, a three-speed fast shutter, $\times 6$ zoom and a stereo microphone.

8mm Video

Sony's Video 8 EVC-X10 at an equivalent price of around £1,473 has a C-mount exchange lens. The CCD-V88 at around £959 has a miniature transport system (one third the standard size) that enables Sony to produce a lightweight (0.9kg) camcorder with full features.

Fuji has announced the first high-grade 8mm tape. It uses super fine metal particles and the same coating as professional M11 tape. The cost is £7 for two hours and £3 for fifteen minutes.

Sony is rumoured to have available the first Super 8mm camcorders but instead opted to display Super hi-band and hi-band Beta equipment. These systems lie midway between the standard Super Beta with 270 lines resolution and ED Beta (extended definition) with 500 lines resolution. SHB Beta has a carrier deviation of 4.8-6MHz with a resolution of 300 lines. The HB resolution is 288 lines. Sony says that both systems are strictly for NTSC markets.

Other Equipment and Systems

Sony also showed four own-made VHS recorders, all with hi-fi sound. Top of the range was Model SLV-7 at the equivalent of about £625 while for the equivalent of about £290 you could get the SLV-P3 video player.

Compact disc video (CDV) was widely represented, all the major companies (apart from JVC who stuck with its VHD system) showing players. There are no less than ten CDV players in the Sony range.

Satellite TV is being pushed in Japan, particularly the forthcoming Muse transmissions. In addition to set-top tuners many companies offered VCRs and TV sets with integrated satellite TV tuners. Sony, Hitachi and Panasonic also displayed flat-panel satellite TV aerials.

Still video cameras were in abundance. Prices showed great variation, ranging from £311 for Sony's MAVICA to £1,116 for Panasonic's AG-ES10. Picture quality was quite good, though still not as good as 35mm film.

The latest video craze in Japan is the videophone. Most units cost around £250 and produce a coarse black-and-white still picture, though Sharp had a model with colour pictures.

So it looks as though several new items will eventually be joining the TV sets, VCRs, camcorders and CD players on the service bench!

VCR Clinic

Reports from Eugene Trundle, Nick Beer, Philip Blundell, Eng. Tech., Chris Plaice, Ian Bowden, Alfred Damp and Joe Cieszynski

Panasonic NV-M5

We couldn't believe that this fault could happen! After the machine had been running for a while the pictures it recorded (displayed in the viewfinder) rolled sideways in a "loss of line lock" condition rarely seen nowadays. Some of the electronics in this machine must have been designed with genlock in mind since the CCD H drive chip has its own VCO, phase-locked to the camera's SSG output. This phase-locked loop was going out of sync — blowing warm air into the region of the CCD drive chip would cause loss of line lock while a blast of cold air would restore it. Normal operation at all times and temperatures was restored when the PLL trimmer on the image-sensor panel had been adjusted. This job requires much dismantling and — in theory anyway! — a set of board extension leads.

E.T.

Sanyo VHR1100

An intermittent fault on this machine took some time to trace and cure. The machine would sometimes thread up then immediately unthread again, with the head drum turning too slowly. Sometimes during play the drum and capstan would both slow down dramatically to give a screen full of noise and very slurred sound. Any attempt at diagnosis would restore normal operation. We finally found that the cause of the trouble was loss of the subcarrier reference feed at pin 42 of the servo jungle chip IC4001. The feed capacitor C1102 was going open-circuit intermittently.

E.T.

B and O VHS82-2

The complaint with this new stock machine was no E-E sound and distorted linear (longitudinal) sound playback. The loss of E-E sound was simply due to the fact that the record-level slider controls were set to minimum. Playback from the linear (lo-fi) sound track was weak and unstable, with a background whistle and hum. The problem lay in the audio head record/playback electronic switch, which was failing to earth the top of the head winding during playback. Under subpanel P550 (top of deck, adjacent to the audio head assembly) there are several surface-mounted components. The collector of T7003, which is amongst these, was not soldered to the print.

E.T.

Sony CCD-F330

The customer brought this machine back the following day, complaining that the autofocus didn't work. Sure enough it didn't — not pilot error as had been suspected. As it's a brand new model (replacing the CCD-V50) the manual hadn't arrived. Nevertheless the autofocus board (AF prefix) was soon found, the fault being traced to a dry-joint on the AF motor connection plug. The number of screening cans in camera heads seems to be increasing: to get to the AF board you have to remove the bottom one, under the lens, and remove the PCB inside to gain access to the screw that holds the bottom half of the can to the frame. With this removed you can get to the AF PCB.

The complaint with another of these machines was of no colour in the E-E and playback modes and, you've

guessed it, no autofocus. We dismantled the camera head and found two joints that had never been soldered on the large FPC: there was also a connector that had not been fitted correctly, half in and half out, between the camera and recorder sections. Having restored colour I delved into the AF PCB and found that the trouble here was a break in FPC135 as a result of which there was no AF on to the PCB. The break had occurred because the FPC had been bent at an adverse angle during assembly and when tightened up it had cracked. Meanwhile the manual had arrived, enabling us to order the part by number — getting it by description could have been tricky.

Less than a week later another of these machines came into the workshop. It was the shop's demonstration model and the complaint was of a ticking noise when the unit was on. It occurred whenever there was drum rotation, as a loom was mislocated and was catching on the bottom of the DD unit. A fair amount of dismantling was again required, just to fit a bit of Himelon which should have been done at the factory! While running the camera on test the picture disappeared. A sharp tap on the side brought it back. Another dry-joint, on the wide FPC. After reassembling it the camera wouldn't switch on due to a moulding fault in the camera standby switching assembly.

N.B.

Panasonic G Deck

Since my article on the G deck appeared in the September 1988 issue we've had several of the new range of G deck machines (Models NV-G40/G45/G48) with high back-tension. In each case the error has been corrected by replacing the back-tension arm spring with a new one from the Panasonic spares department. The new springs are a different colour, duller and not as silvery in appearance, and are minutely shorter. Only a small number of machines in this range seem to be affected. Note that the back-tension specification has been altered. Measure it with a tentelometer at the beginning of a three-hour cassette: the reading should be between 22.5-27.5g. This applies only to the G mechanism.

N.B.

Ferguson FV20

These new machines are very popular and have excellent reliability. The fault with this one was no sound. In fact there was just a buzz in the E-E and playback modes but when going through the scart socket into my monitor the sound was o.k. A new r.f. converter put matters right.

N.B.

Panasonic NV-M7

The drum would sometimes judder and stop while running and intermittently wouldn't start. The drives didn't disappear so it seemed that the DD unit itself was at fault. Fitting a replacement restored correct operation.

N.B.

Grundig VS180

The fault reported on one of these machines was "spots on play". The spots were confined to the centre of the

screen and gave the impression of a tape path fault. When the off-tape f.m. waveform was scoped however it showed that this was not the case. Adjusting the tracking had no effect of course, so I suspected a faulty drum motor. When the motor baseplate was removed the cause of the trouble could be seen — grease had built up on the brushes. When this was cleaned off the spots had gone.

A note in the March 1988 issue reported that leaky capacitors in positions C301 or C305 would result in the reel motors running all the time. In the case I had the capacitor was very slightly leaky and the reel motor rotated only when the on/off switch at the front of the machine was in the off position! **P.B.**

Philips VR6561/6362/6468

Most Philips dealers will by now be dab hands at replacing the rack slider on the current models. It looks a daunting task, but is quite straightforward if you follow the guidelines in the manual. The only tips I would add are as follows. With the deck removed from the machine, use a 9V battery on the control motor to get the mechanism to the position for dismantling. And check that you've got it assembled correctly afterwards! When refitting the top plate I put the pinch roller metal crank into position first then fit the plate, finally using a wire hook to get the belt over the control motor pulley. **P.B.**

Hitachi VT8500

Tape stops while playing is a common fault with these machines. Often it's because the ring magnet that operates the reel rotation sensor is loose or metal debris have stuck to the magnet causing it to jam. **P.B.**

Philips VR6561

If it's powered up without a cassette this machine usually moves the tray in and then out again. With this one the tray moved in and after a few seconds the machine switched off. No, it wasn't a mechanical fault this time: the control motor drive chip IC7251 (L293b) was faulty. **P.B.**

Recent Ferguson VCRs

Here are a few problems we've had with late-model Ferguson VCRs.

Model FV11: Intermittent playback picture — L15 faulty (off pin 13 of IC101). Poor or intermittent tracking — IC2 (VC2023A) faulty. Low gain on high channels — try repositioning the aerial lead that connects the tuner to the aerial splitter.

Model FV12: No functions — ICP1 open-circuit.

Model FV14: No E-E sound — ICP2 on the demodulator panel open-circuit.

Model FV21: Note that early machines have no cover over the mains fuse which is always live. **C.P.**

Ferguson 3V55/3V57

When this machine was plugged into the mains the capstan motor would immediately start up and run for approximately one second. There was no clock display. The on/off LED went on and off correctly when the power button was pressed. If a tape was inserted it would be taken in and down by the carriage, but would then be sent straight out again. Also in the E-E mode all that

could be seen on the monitor was hum.

The loss of clock display was due to lack of a reset pulse for the clock/display chip IC202. If this was provided manually, by momentarily shorting across C207, the display would appear correctly. Then in the E-E mode a distorted, low-contrast picture with hum across it would be seen.

All these faults were caused by an open-circuit — not blown — fuse (F2) in the unregulated 18V power supply. When the fuse is open it disconnects one end of the transformer's centre-tapped secondary winding but the bridge rectifier still provides nearly the correct voltage from the other end. In fact with the fuse open-circuit the 18V supply is approximately 16V in standby and 13.5V in the on condition. **I.B.**

Sanyo VTC5600

The capstan motor slowed. We found that there was no pulse input at pin 19 of the CX143 capstan servo chip Q413. This was in turn due to the CX186 drum servo chip Q401 being faulty. **A.D.**

Ferguson 3V29

Uncontrollable and overloaded E-E video and no playback video were caused by a fault in the playback equalising filter EQ201. **A.D.**

Pye DV468/Philips VR6862

This VCR would accept a tape then immediately eject it. The cause of the fault was traced to point 9B3 not being grounded by switch COD3. The switch itself was in order, the trouble being a broken lead at the deck terminal connection. **A.D.**

Sony SLC6

The complaint with this machine was of intermittent noisy rewind — it made a sound like tape chewing. We found that the large fast-forward pulley (item 424) had moved sideways, twisting the fast-forward belt, because of wear in the fast-forward arm assembly. Replacing the arm assembly (item 421) cured the trouble. **A.D.**

Ferguson 3V36/JVC HRD225

This machine functioned correctly apart from the fact that when unthreading the supply spool wasn't driven in order to pull in the tape as the loading arms retract. Now although this model has a reel idler to drive the spools it doesn't have a reel motor. Instead the idler is driven by a pulley which in turn is driven by a belt from the capstan. Whilst unthreading the capstan motor wasn't being driven and we found that in this mode the drive transistor Q206 was without base bias, though the 5.7V bias was present in the play and fast wind modes. A study of the circuit diagram showed that in play the capstan drive comes from the servo chip, in fast wind it comes from the CPU chip IC201 and during unthreading it's switched by the expander chip IC202 (pin 38). This pin was found to be permanently low, all the other ports relating to capstan motor operation being correct. So, having encountered a number of faulty expander chips in this model, I replaced the i.c. This made no difference! Further checks revealed that R272 (10k Ω), a bias resistor in the drive transistor's base circuit, was open-circuit. **J.C.**

TV Fault Finding

Reports from Philip Blundell, Eng. Tech., Mick Dutton, B. Ross, Bob McClenning, John Coombes, J.S. Ruwala, J.L. Howard, Ray Vesey and David Botto, J. Olijnyk and Nick Beer

Philips G11 Chassis

Hum ripple on the 153V h.t. supply is a common fault on these sets. If it occurs after the BU208A line output transistor has gone short-circuit either the BD201 active filter transistor is leaky or one of the safety resistors in this circuit is open-circuit. Otherwise C4040 (40 μ F) or maybe C4029 (470 μ F) has dried up. Scope checks are helpful here: look for 12V of 100Hz ripple across C4029 and 1V of 100Hz ripple (with minimal line ripple) across C4040.

P.B.

Grundig GSC100 Chassis

There was foldover at the bottom of the screen and cramping at the top. The +D supply to the field timebase module was slightly low at 17V instead of 18.5V. This is derived from the line output transformer, so I checked the e.h.t. by measuring the voltage at pin C of the transformer. This was also low and adjustment of the width control HS had no effect. The width control is mounted on the e.h.t. control module and checks here revealed that R2522 (2.2k Ω) which is in series with the control had gone high in value.

P.B.

Luxor SX9 Chassis

This set wouldn't give a real-time clock display on ITV. We scratched our heads over this one, as did Luxor's UK technical department. The Swedish head office knew the answer right away however. The customer had programmed an unused page number into the text memory. The number was used on each channel except ITV, which meant that the text decoder was searching for something that didn't exist. This was confusing to the clock.

M.D.

Ferguson TX90 Chassis

The complaint with this set was tripping. We'd not previously had this problem with the TX90, but when we checked the power supply we found that the h.t. was high. A resistor that had gone high in value, causing poor regulation, was suspected. We were surprised to find that R225 (33k Ω) and R222 (10k Ω) were both open-circuit.

M.D.

Philips 14TX3504 (TX3 Chassis)

This set suffered from field collapse. We found that the field driver transistor's load resistor R423 (33k Ω), which is fed from the 110V rail, had gone open-circuit.

M.D.

Philips 10CK1120

These sets are proving to be very reliable. We've sold about 120 of them and the only fault we've had was when T9629 (BUZ71) in the battery converter unit went short-circuit due to dry-joints around the line output stage.

M.D.

ITT CVC1150 Chassis

There was a dark screen though the sound was o.k. Checks around the colour decoder chip showed that the

amplitude of the sandcastle pulse was low at 8V. When we lifted the field blanking at pin 18 of the TDA1940 chip a picture with flyback lines appeared. Clamping diode D402 (1N4148) had gone leaky.

M.D.

Philips KT3 Chassis

The picture would occasionally oscillate in size. It was a very intermittent fault and quite a time was required to prove that the tripler was the cause.

M.D.

Philips G8 Chassis (550 Series)

The fault report on this set was "loses brightness during the evening: a tap on the cabinet four inches from the left-hand side used to provide a cure but no longer does". The set was found to be working normally and thoughts turned to the 12V zener diode in the beam limiter circuit. Poor connections on plug J to the line scan unit were the cause of the trouble however.

B.R.

Some Mitsubishi

Mitsubishi Model CP1424B: The trouble with this set was vertical ringing at the left-hand side of the screen. The cause was a poor earth connection to C905 (33 μ F) in the power supply section, close to the line driver.

Mitsubishi CT186: There was no luminance though the chroma was all right and the contrast control had some effect. The voltage at pins 16/17/18 of IC101 should be 11.8V but was found to be about 15V and varying. The cause of the fault was the 2SC2236 12V regulator transistor Q231.

Mitsubishi CT2101: For poor remote control operation check first that the infra-red window is of the modified, slightly larger type. Then if necessary replace the line filter coil L992 in the power input circuit with the modified type.

Mitsubishi CT2227BM: For no sound or raster first check the mains input circuitry. If this is in order check the l.t. supply at the remote control panel – the safety resistor R7A0 (1.2 Ω) tends to go open-circuit.

Mitsubishi CT2027TX: In the event of no sound or intermittent sound check for a high-resistance connection at pin 4 of IC351 (μ PC2002) – preferably replace the chip as a precaution. No colour or intermittent loss of colour can be due to the RGB demodulator but the usual cause is a leaky blanking diode, D209 (1S2076) – check by replacement.

J.C.

Sony KV2752 (RX Chassis)

I've had a very interesting fault on these sets on three occasions during the past year. Customers complain of no remote control operation and no teletext. The clue to what's wrong is that the 6V supply is slightly low at 5V. When I first encountered the problem I suspected the teletext board and found that the remote control system worked when the board was unplugged – the 6V supply returned to normal. A new teletext panel made no difference however. To cut a long story short the culprit turned out to be C655 (220 μ F) on the power board.

Replacing it cleared the faults. On one occasion the same capacitor blanked out the picture, leaving just a vertical moving line down the centre of the screen. **J.S.R.**

Sony RM Chassis

This set would work for five minutes after which the picture disappeared. Voltage checks revealed that in the fault condition the -30V supply was missing. The cause was that coil L810 went open-circuit when the set warmed up. **J.S.R.**

Beovision 33XX Chassis

Here are a few faults we've had with these sets:

- (1) Grey-scale tracking variations were caused by 4R18 (1.8M Ω) which had gone high in value. It's mounted on the c.r.t. base panel.
- (2) The remote control handset volume button worked correctly but sound mute didn't. Replacing diode 1D4 on the tuner/i.f. panel cured the trouble.
- (3) Pulsing on and off was traced to loose screws on the chopper transistor 6TR1.
- (4) No luminance can be caused by high-resistance contacts on the tuner/i.f. contact strip or the same item in the decoder. It can also, often intermittently, be caused by dry-joints on the inductors that form the luminance delay line.
- (5) An insensitive remote control handset was due to one of the LEDs being open-circuit. **J.L.H.**

Tandberg CTV3 Chassis

Pumping on this chassis can be caused by failure of any one of a dozen components on the line output panel. High on the list of items to check for this condition is diode CR738 on the power supply panel. An RS BYW56 is a satisfactory replacement for the BY127 used in this position. **J.L.H.**

Salora Models 1F3K and 1F0

When the memory crashes with remote control versions of these sets the result is a picture that lacks punch – for want of a better word. The adjustments can be restored as follows:

- (1) Set the customer controls to mid-position.
- (2) Adjust the brightness, contrast, colour and sound to the required levels using the remote control handset.
- (3) Press the front button on the μ P board.
- (4) Press the normal button on the remote control handset.
- (5) Press the store button on the TV set *twice*. **J.L.H.**

Panasonic TC2213

Difficulty in selecting a channel using either the channel change button or the remote control handset, coupled with difficulty in storing a station, was corrected by replacing the TMS3452N2L chip. Remember to take anti-static precautions when changing it. **J.L.H.**

Sony KV2752

A new and rather nasty fault on one of these sets puzzled us recently for quite a few hours. It occurred on the RX chassis but the effect is the same with the PE version. The symptoms were a blank raster with sound present. Extensive checks were made around the TDA3562A colour

decoder chip IC301 but nothing amiss was found. The correct signals were entering the chip and the sandcastle pulse at pin 7 was of exactly the correct shape. Feeling that IC301 just had to be faulty we decided to change it, but this made no difference. Eventually we decided to replace IC551 (TDA2578A) which contains the sandcastle pulse generator circuit. The pulse now looked exactly the same but was of greater amplitude. To our relief this restored the picture. Another example of an easy fault – once you know what it is! **R.V. and D.B.**

Philips/Pye KT3/30/35 Chassis

One of these sets suddenly refused to produce a picture, leaving just a smear of chroma. The trouble was that all voltages and waveforms seemed to be in order and panel swapping made no difference. There was a strange waveform on the -20V line at C464 (100 μ F) however. The -20V supply reservoir capacitor C586 (100 μ F) was the cause of the trouble – it had gone open-circuit. **B.McC.**

Some Quickies

Thorn 9600 Chassis: This set came in dead. We found that one of the rectifiers (W518, type SKE2G2/02) fed from the chopper transformer was badly leaky – almost short-circuit in fact.

Thorn 1694 Chassis: This monochrome portable had lost its picture. The e.h.t. overwinding was getting warm because the e.h.t. rectifier, which is built into it, was short-circuit. A new overwinding put the set right.

GEC PIL Chassis: Another dead set – this time the line output transistor was short-circuit. **J.O.**

Sony KX20PS1 Monitor

This set had an overbright picture with flyback lines. R638 (270k Ω) in the first anode network on the tube base was open-circuit. **N.B.**

Sony KX27PS1 Monitor

When a signal was fed in via the BNC video input socket there was no display. The sound was o.k. and a raster was present. Going out to the job I had visions of faulty leads/plugs etc. but everything appeared to be in order. Buffer transistor Q352 turned out to be short-circuit. **N.B.**

Panasonic TC2205 (U2 Chassis)

Panasonic manuals can cause almost as much trouble as a faulty set. In this case the c.r.t. was cut off and we eventually traced the cause to the diodes in the 12V regulator transistor's base circuit – they were both leaky. This is in fact a not uncommon problem with these sets. But the circuit diagram in the manual shows both these diodes as ordinary types, the parts list says they are both zener diodes (no voltage given) while the board layout diagram shows one as being a zener diode and the other not. In fact they are both 6V zener diodes and the blanking circuit is fussy about this – the correct types should be fitted. I proved the point by using two 6.2V zener diodes. **N.B.**

Sony KX20PS1 Monitor

Intermittent chroma dropout was corrected by adjusting the PAL delay potentiometer RV308. **N.B.**

Test Report: Grundig Oscilloscopes

Steve Beeching, T.Eng.

I have recently had for evaluation two of the oscilloscopes, Models M022 and M053, in the current range of Grundig test equipment. On unpacking them the first impression was of the very attractive and well laid out control panels. The colour can only be described as fawn with a hint of green, the lettering being white. This proved to be very easy on the eye. The M022 has a bandwidth of 20MHz while the more comprehensive M053 has a bandwidth of 50MHz. We'll deal with the M022 first.

Model M022

During the time I spent using this oscilloscope I was impressed by the ease with which I could glance up from a circuit test point and locate a control or a switch to change ranges. The controls are very easy to read and adjust and avoid the confusion that is so often present with a clutter of controls, symbols, etc. I suppose the term "user friendly" would sum up the familiarity I felt after just a few minutes' use.

The M022's control panel is divided horizontally into upper and lower sections, the lower section for vertical controls being subdivided into three sections while the upper section for the timebase controls is subdivided into four sections. The tube controls are at the lower left – focus, intensity, trace rotation (preset), push-button on/off plus a calibration test point. Two further sections cater for the ch. 1 and ch. 2 inputs for the dual traces. These inputs are identical except for an additional earthing point on ch. 1. Each input consists of a standard BNC plug, the impedance being $1M\Omega$ shunted by 25pF. Maximum input is 400V, including any d.c. There's a slide switch for a.c., O and a.c./d.c.: the a.c. setting blocks the d.c. component, O is an open input internally clamped to ground via 68Ω while a.c./d.c. is a straight input.

The input sensitivity selector ranges are from 5mV/cm to 20V/cm in 1, 2, 5 steps, i.e. 0.5V, 1V, 2V, 5V, 10V etc. In addition to vertical shift and variable/calibrate controls there's an inverter push-button. Vertical shift ranges from well below the screen to well above, quoted as +6cm to -6cm from the mid-point, the screen being calibrated to + or -4cm. The rotary calibrate control varies from a fixed position fully anticlockwise to up to 2.5 times the selected V/cm setting.

Triggering Facilities

A four-position lever switch for the triggering mode gives "automatic", "normal" (with an additional variable level control), "TV vertical" and "TV horizontal", with a push-button to select triggering on the positive- or negative-going slope of transition edges. The push-button is not marked: it's in for negative and out for positive, with indication by positive and negative "S" curves. Above the variable trigger level control there's a green LED which lights when the scope triggers from a signal, as an aid to setting the trigger level for repetitive triggering.

A second four-way lever switch selects a.c., d.c., l.f. or h.f. triggering – l.f. is for frequencies below 8kHz and h.f. for frequencies above 10kHz. A third four-way switch selects the trigger source, ch. 1, ch. 2, the 50Hz mains ("line") or external. These three switches, mounted to-

gether, give a wide range of trigger sources and types covering most TV and video needs plus general-purpose inputs, as follows:

- (1) ch. 1/ch. 2/line/ext
- (2) auto/normal/TV field/TV line
- (3) a.c./d.c./l.f./h.f.

This indicates the trigger options, first the source on switch (1), then the type on switch (2) and lastly the signal parameter on switch (3). Note that these switches have no function when the source is TV sync pulses.

The Traces

In the centre of the panel there's a trace selector switch for ch. 1, ch. 2 or both, i.e. dual traces. "Both" is written in darker green, indicating that it refers to the switch to the right giving chopped or alternate traces or ch. 1/ch. 2 addition.

Each of the ch. 1 and ch. 2 inputs has an invert option. Thus when used in conjunction with the add setting ch. 1 can be subtracted from ch. 2 or vice versa. This is useful for setting up camera tubes.

A second timebase, referred to as "B", has two lever switches for trigger and display selection, a rotary control covering 0.5 μ sec/cm to 2msec/cm and a delay control. The first lever switch has three positions, A, "B INT D" and B. Position A displays the A timebase while the unusual "B INT D" position displays the A trace with a brightened portion which is the delayed B timebase section. The timebase range selector expands the brightened portion to cover more of the A trace, while the delay control moves it sideways through the A display. The third position of the switch changes the display to the brightened portion and expands it to fill the time scale. Thus at the flip of a switch you can display A, A brightened by B, or B only. The main purpose of this delayed timebase arrangement is to enable a portion of the A trace to be selected and expanded for closer study.

The second lever switch selects timebase B's trigger mode – free run, A or not A. In the free-run mode the B timebase starts after the delay period has elapsed, i.e. at the start of the brightened portion. In the A position it starts after the next positive or negative trigger slope – determined by the position of the A slope polarity control. In the not A position the B timebase starts at the inverse of the next slope selected by the A setting.

Auto-ranging Timebase

Without doubt the best feature of the oscilloscope is the auto-ranging timebase, which selects the best time scale from 0.5 μ sec/cm to 200msec/cm in eighteen ranges. The signal has between two and a half and five and a half cycles displayed on the screen, depending on the time scale used, the latter being indicated by one of nine green LEDs in a horizontal row – calibrated 0.5, 1, 2, 5, 10, 20, 50, 100, 200 similarly to the vertical calibration. Two more LEDs light to indicate whether the row is μ sec/cm or msec/cm, giving the total of eighteen scales in the range.

There are two further controls, a fine control that provides up to 2.5 times the indicated display, with a

central detent position for the calibrated display, and a manual range control. The latter has an auto-ranging position when fully counter clockwise: when turned each green LED lights up in turn to indicate the scale. The operation of this control seems at first strange as it's linear instead of being a stepped switch, but it's pleasant when you get used to it – and not hard on the wrist!

In addition to the horizontal shift control there's a hold-off control whose function is to provide a "pause" between the completion of a trace sweep and the next trigger point to start the following sweep. It's variable and enables complex waveforms to give a stable display. An example is the display of TV lines that have shadowing in the background due to the half-line offset – this can be cleared with the hold-off control. Also, asynchronous digital signals such as bursts of serial data can be more clearly displayed by preventing unwanted sweeps that mix up the display by overlaying unwanted pulses.

Performance

I could quote the various tolerance figures for d.c. drift etc., but they are so low as to be unnoticeable in normal use. For measurement purposes the timebase is accurate to ± 3 per cent while the vertical calibration is accurate to ± 3 per cent with a 0-20MHz bandwidth (-3dB).

The main question of course is what is the scope like to use? I put it through its paces for a week or so on VCRs, camcorders and compact disc players in order to be able to compare its capabilities with my Philips oscilloscopes.

There were no problems at all when searching through servos or signal paths, and I was able to set up the "eye" patterns on JVC CD players easily. At times the auto-ranging timebase got in the way and I went to manual but at other times it was a blessing. The timebase triggering is excellent – it never missed a beat. For signal checks around colour processing circuits where it's difficult to trigger from a signal I locked the second channel to a suitable video signal point and traced around with ch. 1. To set shading characteristics with cameras it's very useful to be able to subtract ch. 2 from ch. 1: the M022 is very good in this respect.

VCR Head Switching Adjustment

The worst and most frequent use with a VCR is to set the video head switching points. For this, ch. 2 is triggered by the head switching signal and ch. 1 monitors the video signal. The timebase is then expanded to view the field sync pulses, so that the switching point can be set to 6.5 lines before the start of the field sync period. As the trace is fully expanded, the brightness decreases and the focus gets worse – stretching the tube to its fullest. The reason I've used Philips oscilloscopes is the 10kV post-deflection acceleration operation of the tube, which keeps the beam stable when fully expanded. The M022 has only 2kV and I expected it to fail in this task, but not so. While the brightness falls off, the trace is viewable except when too much ambient light falls on the screen. Focus is maintained as a result of the "automatic focus" achieved by high-voltage regulation. In addition, I understand that a hood is available as an optional extra.

Model M053

The M053 is a higher grade version. It has an 11kV tube acceleration voltage and 50MHz bandwidth and is better able to cope with the problem of setting video head

switching. The layout is similar to that of the M022 but is not so attractive. Being more comprehensive, it takes a bit more driving. In fact it comes within the category of professional equipment.

The vertical range is from 2mV/cm to 10V/cm and the inputs are positioned in the same part of the front panel as with the M022, i.e. the lower half. Each range switch has an outer knob for selection and an inner knob for variable sensitivity – it pulls out for amplifier invert. With the inputs are the vertical trace selectors ch. 1/both/ch. 2 and alt/chop/add and the vertical shift and a.c./d.c. input selection controls, also a single alternate sweep separator which really belongs with the timebase controls above.

The main tube controls are on the lower left: dual-purpose rotary on/off with intensity, single-button beam finder, trace rotation and calibration test point. The focus and tube graticule illumination controls are together, rotary for focus and pull out for illumination. Unlike the M022, I sometimes found that I sat waiting for the trace to appear after switching on because I'd not rotated the control sufficiently to brighten it.

The main timebase A has auto/normal/TV/ $\times 1$ trigger modes. A reset button allows $\times 1$ to provide a one-shot sweep. A separate switch selects V1/V2/Horiz which apply only in the TV mode: V1 triggers twenty lines before field sync in field one and V2 at the same point in field two, the Horiz position being for TV line sync. There's also a d.c./a.c./l.f./h.f. selector as in the M022. Trigger slope is also selected by a single in/out push-button but with green LEDs to indicate the trigger slope. This is mounted next to the variable trigger sensitivity control along with a green LED to indicate triggering.

Two switches act together for trigger source ch. 1/both/ch. 2 and internal/line/external/external $\div 10$. Both are similar to those described for the M022 except for the external $\div 10$, which gives an extra factor of trigger level from an external source, and "both" – if two signals on ch. 1 and ch. 2 are without interrelated timing (non-synchronous) they can both be displayed as stable signals by alternately triggering from each (this is not effective in the chop mode).

Delayed timebase B has a ten-turn precision potentiometer for the delay time and a single-turn control for trigger level with a free-running position fully anticlockwise. The slope is always the same polarity as selected for A. The display facilities are much more comprehensive however, via the timebase selector switch positions.

The A/alt/B/X, Y switch operates as follows. In the A position there's normal display of ch. 1/ch. 2, alternate or chopped. The alt position gives display of Ach. 1, Ach. 2, Bch. 1 and Bch. 2, i.e. four traces, two main and two delayed, with the main traces carrying a bright-up portion representing the section that's displayed by the delayed traces. This is where the alternate sweep separator comes into its own, adjusting the vertical separation of the four traces. The third switch position B gives a display of the delayed traces only, and finally the X, Y position puts ch. 2 into operation as an X amplifier with limited bandwidth (about 1MHz).

As with the M022, the M053 has an auto-ranging main timebase with optional manual control, this time in 21 ranges from 0.1 $\mu\text{sec/cm}$ to 500msec/cm with the 1, 2, 5 scales previously mentioned. A comprehensive digital display shows the time/cm, with an indicator on the left showing A or B timebase and indicators on the right showing nsec/cm, $\mu\text{sec/cm}$ and msec/cm. Two push-buttons step through the range manually, one for up and one for down, with a single button for auto/manual and a red

LED to indicate manual.

Finally there are along the upper part of the control panel a $\times 10$ timebase expansion button with a red LED, a variable time-scale control with a calibrate detent, a hold-off control as described for the M022 and a horizontal shift control.

Conclusion

The M053 is a much more comprehensive oscilloscope than the M022, with better display facilities and a complexity designed to suit the proficient engineer. It can

be recommended as a main, wideband workshop oscilloscope for the serious user. The crunch is that you will have to pay something like £950 for the M053 while the M022 costs around £500, which without doubt makes it excellent value for money — what more can I say than that an M022 now graces my camera setting bench, along with a broadcast standard vectorscope and a Grundig VG1000 broadcast standard pattern generator. The equipment is available to Grundig dealers via their local Technical Liaison Officer. In case of difficulty, these items can be obtained from Newark Video Services, Grove Farm Estate, Barnby-in-the-Willows, Newark, Notts NG24 2SG.

Long-distance Television

Roger Bunney

There was a lot of DX-TV propagation during October, via Sporadic E, auroras, F2/TE, the troposphere and the daily meteor scatter. It looks as though things are getting better, especially with F2 as a result of the increasing sunspot count — hopefully we'll be experiencing a productive winter. The general SpE log for the month is as follows:

4/10/88	TVE (Spain) chs. E2, 3; +PTT (Switzerland) ch. E3.
5/10/88	TVE E3.
7/10/88	NRK (Norway) E2; DR (Denmark) E3, 4.
10/10/88	TVE E2.
11/10/88	+PTT E3.
12/10/88	TVP (Poland) R1; TVE E2, 3.
14/10/88	TVE E2, 3, 4.
17/10/88	TVE E3.
21/10/88	TSS (USSR) R2.
22/10/88	TVE E2, 3, 4; TDF/C+ (Canal Plus — France) L3.
25/10/88	RTP (Portugal) E2.
26/10/88	TVE E2, 3, 4.
27/10/88	TVE E2.
28/10/88	TVE E2.

Auroral reception was reported by Iain Menzies (Aberdeen) as follows: NRK/TSS Band I signals on the 6th leading to RUV (Iceland) ch. E3 early on the 7th; NRK on the 9th; NRK/TSS on the 11th; NRK again on the 18th.

A stable high-pressure system over the UK from the middle through to the end of the month gave enhanced tropospheric propagation in Band III and at u.h.f., with particularly spectacular signals over the 15th-17th. On the 15th Band III/u.h.f. signals from West Germany plus the more usual French/Benelux stations were received in south/central UK. The 16th was the most significant day, with reception over most of the UK from West/East Germany, Scandinavia (Norway chs. E5-9, Sweden chs. E8, 9 and 30), the Benelux countries, France and RTE (Ireland). DFF (East Germany) was received in N.W. Wales on chs. E5, 6, 11, 12 and 34 while u.h.f. signals from the expanding French fifth and sixth networks were received in the north Midlands. Many enthusiasts reported reception of RTL+ (Luxembourg) ch. E7 and AFRB (American Forces) ch. A80. Conditions declined on the 17th, though many West German Band III/u.h.f. signals were received along the south/east coasts.

Undoubtedly the most interesting point however is that the increasing m.u.f. has resulted in the first F2/TE reception of the present solar cycle in the UK. Roger Fussel (Torpoint) received TE signals from NTA (Nigeria) on the 9th, from 1650-1720: first a grey-scale test pattern, then programme material with music. The signals suffered from severe fading and smearing, a characteristic of this mode of propagation. On the 25th, 27th, 29th and 30th Garry Smith (Derby) logged early morning F2 signals on chs. R1 and E2 at varying times between 0750-0912. The signals were strong at times though with smeary video — the R1 signals were from the USSR with the E2 signals on the 30th thought to be of Arabic origin. On the 31st Cyril Willis (Kings Lynn) received very strong ch. R1 signals from the USSR, first the test card, then programmes from 1115 with ch. E2 vision buzz (no pictures could be locked), followed by a locked line sawtooth on ch. E2 at 1245 and then captions and football, fading out at 1300. It all looks good!

With an increasing number of European countries allowing Amateur Radio operation in the 50MHz band we should be getting a closer insight into the possibilities of DX propagation at these frequencies. Contacts have already been made between the UK and the USA, also South Africa. Those with equipment tunable over 30-50MHz may, under suitable conditions, hear interesting communications signals from various parts of the world, e.g. rural US highway patrols, fire brigades, Middle Eastern communications, etc.

Meanwhile Anthony Mann in Perth, W. Australia reports a remarkable F2/TE opening on the 29th, with reception from China on channels up to C4 (77.25MHz vision). During most of the evening the signals were at very high levels, particularly on ch. C2. There was a general fade-out at 2400, after some four hours of reception. Other TV channels received were on frequencies 48.25MHz, 49.75MHz, 55.25MHz (E3 and A2), 56.25MHz, 59.75MHz, 61.25MHz and 62.25MHz. It seems that some of the signals were given an SpE boost over their final path to Perth. SpE reception had been prevalent during the day, with the 50MHz amateur band open to Hawaii. On the 15th a mid-afternoon SpE opening produced signals at up to 56.25MHz. In eastern Australia Robert Copeman and Todd Emslie report enhanced F2/TE conditions, with China ch. C1 received in Sydney on three occasions early in the month and many low-band v.h.f. communications signals received from the USA, Mexico and China, also the Korean Broadcasting System f.m. links at 30.4MHz. Incidentally Robert reports that TVQ has moved from ch. 0 to Band III while DDQ on Darling Downs has moved from ch. 10 to ch. 0 — one to look out for if the F2 conditions improve considerably. I recall one day during the last sunspot cycle when three ch. 0 signals were present floating over each other — it

does happen!

Hugh Cocks reports from the Algarve, Portugal, that TE conditions were excellent during September and early October, with ZTV (Zimbabwe) ch. E2 being received on most evenings from 1600-2000 BST, Nigeria/Ghana ch. E2/3/4 signals often being present and on good days ch. A2 signals from Brazil. Picture quality appalling of course, with multiple imaging and smearing.

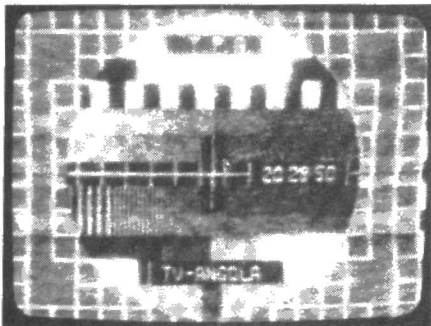
We hear that during the excellent tropospheric opening on September 9/10th two DXers in Holland received TVE-2 signals on chs. E37 and E42. The same opening produced really intense ducting farther to the south, with amateur radio contacts between the Canaries and the UK in the 144MHz band, reaching also (just) to the Norwegian coast. According to a report in the RSGB's *VHF/UHF Newsletter* a Leicester amateur (G4GLT) noted regular reception of Zimbabwe TV at 48-258MHz via TE during a twelve-day period in September, at various times from 1640-2100 but mainly between 1800-1930. I assume that this reception was at scanner level within a narrow a.m. bandwidth rather than the 2-3MHz bandwidth that TV-DXers would use in order to be able to lock the video signal. It's common here at Romsey to hear a low-level video buzz from the south within a 5kHz bandwidth at times appropriate for TE reception of ZTV, though with the signal well below the noise threshold even using a 1.5MHz TV bandwidth.

An active and interesting month then. My thanks to the following for sending in reception reports: Roger Fussell (Torpoint), Garry Smith (Derby), Hugh Cocks (Portugal), Simon Hamer (Powys), David Oliver (Birmingham), Peter Schubert (Rainham), Tim Anderson (St. Leonards), Bill Cotterill (Tipton), Anthony Mann (Perth), Cyril Willis (Kings Lynn) and Iain Menzies (Aberdeen).

News Items

Belgium: A local TV station, TeleBruxelles, opened in early October on ch. 36 with horizontal polarisation. The 10m high transmitter mast is atop an eight-storey building with the main beam apparently to the N/NW. A half hour local news/magazine programme is repeated from 1800-2400 weekdays with an omnibus edition at weekends from 1200.

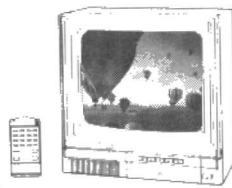
France: The BDXC has kindly sent us a list of Canal Plus transmitters in Band I. Note that some of these stations are relays. Ch. L2 Drap H, L'Arbresle H, Amiens H, Bastia V, Chartres V, Nemours V; Ch. L3 Le Plessis H,



Yes, Angola does use the PM5544 test pattern! Seen here via a Gorizont (14W) Band C downlink on its global beam. Photo of reception by Ian Waller, Lincoln.

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Carcassonne V, Besancon V; Ch. L4 Mont Vial H, Mont Brian H, Ussel H, Quimperles H, La Roche/Yon H, Etampes H, Rennes V, Orange V. H = horizontal, V = vertical polarisation.

We regret having to report the death of Michel Dubernat, a well-known and very active TV-DX enthusiast over many years.

Teletext adaptor: A French firm is producing a teletext adaptor whose output plugs into a TV set's scart connector. It's a dual-standard decoder able to handle both UK and French teletext. The cost is 2,200 French francs, but French VAT may be deductible at 18.6 per cent. Enquiries, with return postage, can be sent to Societe Reinau Audio Visual, 1 bis rue Pernoux, 92160 Antony,

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Meteor Shower Dates for 1989

Our grateful thanks to George Spalding of the Meteor Section, the British Astronomical Association, for providing us with meteor shower information for the coming year as follows:

Quadrantids January 1-6th peaking on the 3rd at 1500 ± 3 hours.

Lyrids April 19-25th peaking on the 22nd.

May Aquarids April 24th-May 20th peaking on May 5th.

Delta Aquarids July 15th-August 20th peaking over July 28-30th.

Perseids July 23rd-August 20th peaking on August 12th at 1400 ± 12 hours.

Orionids October 16-27th with a flat peak over the 20-23rd.

Taurids October 20th-November 30th with a flat peak over November 1-8th.

Leonids November 15-20th peaking on the 17th.

Geminids December 7-16th peaking on the 13th at 2100 ± 6 hours.

Ursids December 17-25th peaking on the 22nd.

New EBU Listings

Station	Service	Channel	Output
France			
Toulouse/Pic du Midi	TDF-5	E29	80kWH
Clermont Ferrand	TDF-5	E30	100kWH
Laval/Mont Rochard	TDF-6	E30	20kWH
Marseilles Grand Etoile	TDF-5	E32	150kWH
Clermont Ferrand	TDF-6	E33	100kWH
Laval/Mont Rochard	TDF-5	E33	20kWH
Brest	TDF-5	E34	100kWH
Le Mans Mayet	TDF-6	E35	150kWH
Orleans	TDF-6	E36	20kWH
Marseille Grand Etiole	TDF-6	E38	100kWH
Toulouse/Pic du Midi	TDF-6	E38	80kWH
Villiers	TDF-5	E39	25kWH
Mezieres	TDF-6	E41	5kWH
Bourges	FR3	E43	30kWH
Chartres	TDF-6	E44	50kWH
Sens	TDF-6	E44	40kWH
Mezieres	TDF-5	E44	5kWH
Bayonne	TDF-6	E45	40kWH
Chartres	TDF-5	E47	50kWH
Sens	TDF-5	E47	40kWH
Tours-Chissay	TDF-6	E54	80kWH
Bourges	TDF-6	E56	130kWH
Le Havre	TDF-6	E56	20kWH
Villers-Cotterets	TDF-6	E57	25kWH
Lyon Mont-Pilat	TDF-5	E59	250kWH
Brest	TDF-6	E60	100kWH

West Germany:

Wesel Ind. E52 200kWH

H = horizontal, V = vertical polarisation.

Satellite TV

The first high-power European TV satellite, the French TDF1 at 18°W , is now in orbit and testing — I received it here on November 15th. The D2-MAC transmissions included colour slides and an identification with date.

With a 1.5m dish the 62dBW signals were extremely strong. They are right-hand circular, a linear LNB showing no signal variation when switched between vertical and horizontal polarisation. Reception was at 11.727GHz , the extreme h.f. end of the European DBS band. During the previous week I received the PanAm satellite at 45°W with coverage of the US elections — this despite the fact that a neighbouring house almost obscured the dish. Test patterns and programmes from this satellite have been noted at 11.515 and 11.479GHz . When Ian Waller contacted the uplink site in the USA he was told that CNN is considering a business video channel but that apart from this the main TV transmissions are at present to South America, in Band C.

MTV is using an Intelsat transponder at 27.5°W , with both vertical and horizontal polarisation. Radio Nova is carried on a subcarrier with vertical polarisation, its previous "home" on a subcarrier of the now deceased Canal 10 being vacant. Universa, a Spanish-language service from the USA, may be downlinked via ECS4 at 13°E from early 1989. Scansat/TV3 is to launch a second channel to compete with TV2 — the latter started on October 1st for the Danish market. The new link will be via Astra. Gorizont at 14°W has been testing a new scrambling system on its Band C spot beam — there's little sign of any video transmissions from this craft's 11GHz transponder.

A new, easy to use satellite guide listing programmes, satellite downlinks and languages is available from Tele-Audiovision Medien GmbH, PO Box 801965, D-8000 Munich 80, West Germany for only one IRC. The information includes the latest Eutelsat changes, Astra, etc. Ask for *Europas Satelliten Übersichtstabelle*. Highly recommended, and a very generous offer!

Thanks to Ian Waller of Lincoln for reporting on various satellite news items.

Maplin Electronic Supplies can supply F plugs, sockets, female in-line barrels and F male to BNC female adaptors at lowish cost for anyone using TVRO equipment with American F outputs/inputs. I was able to connect low-loss coaxial cable directly to an F plug by soldering the screen to the plug body (after pretinning the body). Two layers of heatshrink covering were then applied to provide physical support. With care an efficient termination can be made, giving a low insertion loss compared to the use of adaptors.

The British Amateur Television Club recently published material from US amateur Henry B. Ruh of Des Plaines, Illinois, in which he discusses the possibility of amateur TV operation on future space missions. The suggestion is to use fast-scan TV with reduced bandwidth and f.m. video at 434MHz or say 439.25MHz (the latter suggested by Motorola). The Americans are seeking comments from interested parties in the amateur field and a working committee of experienced ATV operators is being formed to give the matter further consideration and make recommendations to NASA.

Miscellany

It's to the bottom of the class for me. Two readers who have purchased my TV-DX book have pointed out that the photograph showing double-hop multipath SpE reception on page 12 is from Jordan TV, not Syria.

A reader in Portland is seeking a photocopy of the circuit for a Bush Model R130 valve radio. Can anyone help?

Service Bureau

Requests for advice in dealing with servicing problems must be accompanied by a £2 cheque or postal order (made out to IPC Magazines Ltd.), the query coupon and a stamped addressed envelope. We can deal with only one query at a time. We regret that we cannot supply service sheets nor answer queries over the telephone.

PHILIPS G11 WITH TELETEXT

This set works fine for about twenty minutes then the brightness starts to decrease and the teletext starts to play up. Eventually the picture loses colour lock and goes into bars. I've tried replacing the teletext panel, the chroma/luminance can and the colour decoder chips without success. The colour finally disappears altogether, though not on all channels. On text all I get when the fault is present is a vertical row of P100s down the left-hand side.

The teletext decoder will function correctly only when it sees valid data, so the problem that upsets the brightness etc. is also degrading the received vision signal. This suggests that the voltage on the LT2 line is varying. First check that the LT1 line (17.5V) is present and correct when the fault is present. If not, suspect C3150 (150µF) and possibly C5067 (10µF). If the LT1 voltage is correct, suspect the 12V stabiliser chip IC5073 (TDA1412).

GRUNDIG CUC720 CHASSIS

There appears to be an a.g.c. fault on this set. The picture is good for most of the time but when there's a bright object, e.g. captions or something bright in the scene, the rest of the picture goes very dark and no amount of contrast control adjustment will make it any better. The fault is also intermittent: it's sometimes there when the set is switched on while at other times it appears only after the set has been working for a time. The voltages around the TDA5500 i.f. chip have been checked and seem to be within 1V or so of those shown on the circuit diagram.

First check the a.g.c. decoupler C2216 (1µF, 63V). If it's o.k. you will need to hook a d.c.-coupled scope to pin 21 of the tuner/i.f. module to check for correct signal level and video/sync ratio (should be 7:3). If this check shows wrong levels for waveform five (should be 2.2V peak-peak) replace the TDA5500 or fit an exchange module. If the waveform is o.k. when the fault is present the cause of the problem could be loss of clamping/black level in the decoder module. The Y signal is a.c.-coupled to pin 10 of IC2515 and is internally clamped by the pulse that enters at pin 8. Check C2541 (2.2µF, 50V) etc.

PANASONIC NV370

When a tape is loaded and play is selected, instead of normal forward tape movement the tape usually runs at the correct speed but in reverse, thus looping and chewing the tape. This fault is intermittent – sometimes playback is normal, but going into reverse is more common. Also when play is selected the machine goes into pause/still picture – there seems to be no set sequence to it. The digital readout on the display/counter sometimes runs backwards when

playing or recording. When the tape is loaded and rewind/forward is pressed the readout will show correctly but nothing happens. Then after about four seconds the machine goes into the stop mode. When rewind/forward is again pressed the machine works correctly.

For the play backwards fault, check whether pin 39 of IC6001 rises above 1V. If it does, IC6001 is suspect, though IC2002 could be responsible – isolate the appropriate pins to prove which chip is causing the trouble. The other faults will probably be cured by fitting a new mode select switch (VES0246) and idler arm unit (VXP0521).

FERGUSON TX9 (PANEL PC1040)

The colour is normal when the set is first switched on but after about half an hour it disappears. Freezing the 4.43MHz crystal restores the colour, but changing the crystal, the decoder chip and adjusting the oscillator has failed to cure the fault.

We've encountered this puzzling fault on more than one occasion. In each case the cause has been that the direct-path gain control RV67 in the chroma delay line circuit has a high-resistance or open-circuit track.

GEC C1402H

This set worked well for six years then started to take some time to come on. Eventually it failed altogether. Some defective components were found in the switch-mode power supply: when these were replaced power was restored but only a poor monochrome picture was obtained, with perfect sound but no operation of the contrast, brightness and colour controls. Eventually the power seemed to fade away and the sandcastle pulse feed transistor T873 (BC238B) on the decoder panel blew.

First check the 12.6V line at C706. You'll probably find it high – if so replace the 7812 12V regulator chip IC700 in the power supply. If the fault remains, note that T873 is an emitter-follower feeding pulses to IC800 (TDA2151) and IC870 (TDA2140), both of which represent emitter loads. One or other of these is likely to be defective – check by substitution.

SHARP VC8300

The loading motor goes backwards. Sometimes the recorder will load, but it then unlaces before the take-up spool has rotated by more than a quarter of a turn. The cassette lamp lights up, the head drum rotates and all the sensors seem to be all right. The head switching pulse is not being fed into the microcomputer chip, i.e. there's no 30Hz rectangular waveform at pin 58 of I801. The play, record and fast forward lamps light up but the mechanism doesn't respond.

The pulse waveform at pin 58 of I801 should in fact be 25Hz. It comes via I808 pin 10, I802 pin 5, I701 pin 20 (TP708), Q702, connectors AB1 and K11 on the drum

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motor. Check this path. Reversed operation of the loading motor could be due to faulty loading switches or failure of 1805.

FERGUSON 3787

When this set is switched on there's no sound or raster, the c.r.t.'s heaters don't glow and the fusible resistor RU05 gets excessively hot.

The usual cause of RU05 overheating is a short-circuit or leakage across the U1 (290V) rail. Check this with an ohmmeter – the flyback thyristor DA12, which incorporates a reverse diode, is in particular suspect. Another possibility is that conduction via the start-up diode DR03 is being sustained because thyristor DU04 doesn't come on – check DU04, TU07 etc.

TEST CASE

313

Each month we provide an interesting case of TV/video servicing to exercise your ingenuity. These are not trick questions but are based on actual practical faults.

The repairs inwards bench can sometimes be a depressing sight. Take the other Monday morning: a Bang and Olufsen with intermittent pumping ("seen by engineer, customer very angry"); a Decca "not right since last repair, free of charge please"; a rental Mitsubishi, repossessed due to arrears, about fit for the scrap heap; a Ferguson TX model reeking of cat's pee, "estimate for insurance"; and so on. Amongst this lot there was a little Pye 14in. colour set with the simple comment "low height" on its job card. We pounced on it!

Its Model number was 37KT2060/05W and it was fitted with the CTX chassis – the CTX-S version. Tuned in to a test card the set displayed a picture that was centred but decidedly lacking in height – say 60 per cent of full height. The width was correct and the field linearity fine. Our first action was obviously to wind up the preset height control to see what it would do. The height could certainly be turned up, but the potentiometer had to be at nearly maximum before the picture reached the top and bottom of the screen, and at this point the sides of the raster bowed out. So we restored the height control to its original setting and consulted the manual.

The field amplifier and output stages are within a TDA3651 chip, IC7400: tests commenced here. IC7400's supply voltage comes from the line output stage. It measured correctly – 26V at the anode of D6400. The field oscillator is in another chip, a TDA2577, which also contains the sync separator and line generator stages. The voltages at the pins relevant to the field timebase were found to be reasonably close to those quoted in the manual. Out with the scope! The sawtooth provided by the output stage, at pin 5 of IC7400, was way down in

amplitude compared to the waveform shown on the circuit diagram. Our next check was at IC7400's input, pin 3, where the waveform did not resemble that shown in the manual. We proved that it was low in amplitude by whipping the back off our VCR monitor, which has a similar chassis.

Resisting the temptation to continue swapping notes between the two sets, we pressed on with our diagnosis. Negative feedback from the output stage is fed back to the sawtooth generator in the TDA2577 chip, and we suspected trouble here. Accordingly the series resistors R3404 and R3409 were checked. They were o.k. At this point we discovered the fault-finding tree on page 18 of the manual. Was there any effect on the raster sides it asked us? Yes, the bowed-out sides moved when the height control was adjusted. Check the height control and the field output chip said the tree. We checked the height control, which was o.k., but balked at chip replacement at this stage.

Time for coffee. As is so often the case, when we returned to the job fresh after our break we had a new insight into the problem, which was solved almost at once. Thinking about all the symptoms together led us to the answer: low height with excessive EW pincushion distortion correction; both chips apparently working correctly; a height control which forms part of a negative feedback loop. One small component was fetched from the stores and dabbed across two points in the CTX circuit. When this was done the height shot up beyond normal. What was the component? For the answer, see next month's issue.

ANSWER TO TEST CASE 312 – page 129 last month –

Last month's fault, on a Sony KV2204UB, was a strange one. At intervals, particularly when the set had warmed up, the picture brightness would decrease while the sound level increased. There had to be a common cause, but the main factors common to the relevant circuits, such as the supply line voltages and the analogue control chip IC003, had all been eliminated by making voltage measurements.

The audio and video signal processing chips are IC203 and IC301 respectively. Each has a control pin for output level, 5 and 4 respectively. The chips were responding correctly to the control commands when the fault was present – the voltage at pin 5 of IC203 rose while that at pin 4 of IC301 fell.

The cause of the problem turned out to be in the mute circuit. When the muting transistor Q001 conducts it pulls down the cathodes of D201 and D304 to cut off both the sound and vision. What was happening here was that some strange leakage or similar effect intermittently occurred in D201. This bled some of the brightness control voltage to the audio control line, increasing the latter from its typical figure of 3.4V while simultaneously reducing the voltage at pin 4 of IC301. The fault could be made to come and go by heating and cooling D201. It was permanently cured by replacing D201 and, just in case, D304.

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